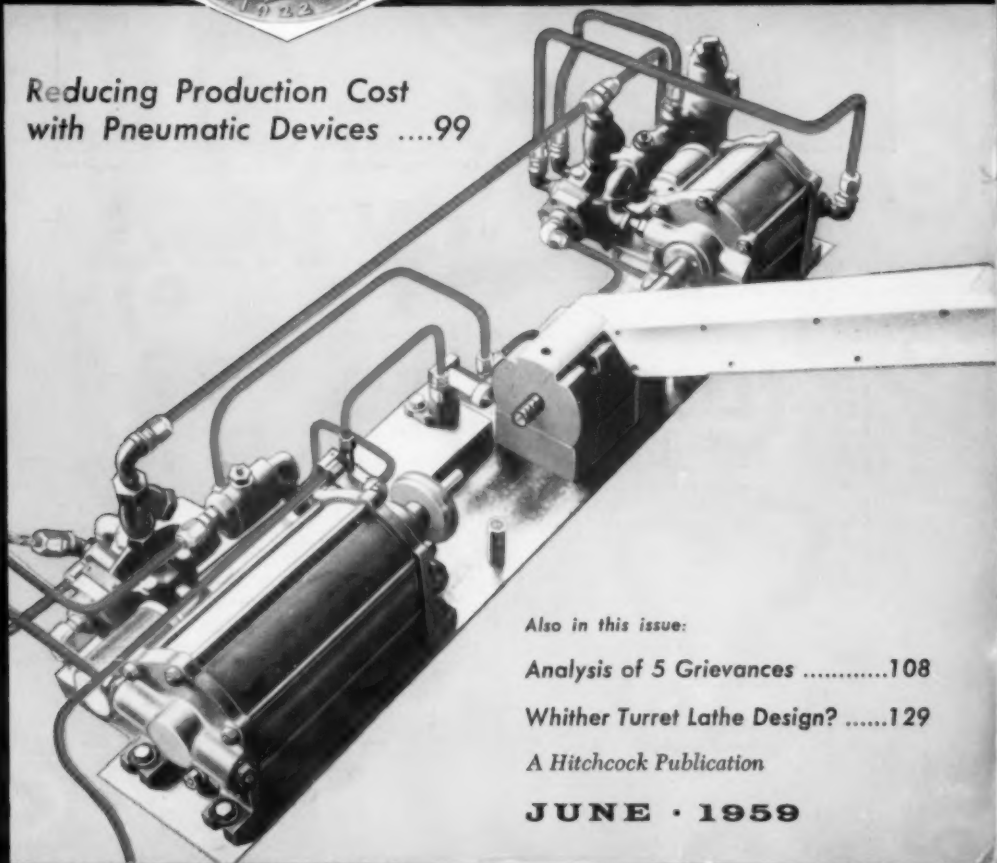


# Machine and Tool **BLUE BOOK**



*Reducing Production Cost  
with Pneumatic Devices ....99*



*Also in this issue:*

*Analysis of 5 Grievances .....108*

*Whither Turret Lathe Design? .....129*

*A Hitchcock Publication*

**JUNE • 1959**



*This is a MARVEL High-Speed-Edge Hack Saw Blade Cutting a 4" x 4" Titanium Billet*

## EVERYTHING'S IMPROVED BUT THE

# GUARANTEE

33 years ago, MARVEL introduced the first welded-edge hack saw blades... guaranteed them to be shatterproof... and a new concept of power hack sawing came into existence.

In combining, by welding, two materials—a narrow, high speed steel cutting edge, and a tough alloy steel body, MARVEL pioneered the modern hack saw blade.

When operators learned they could apply the heaviest feed pressures and highest speeds to the new MARVEL Blades with complete confidence that they would never shatter or "explode" to cause them personal injury, hack sawing began the approach to its present high level of efficiency. Even cutting "exotic" metals, such as titanium, where heavier feed pressures are a necessity, the MARVEL Blade does an outstanding job and is completely safe.

Today's MARVEL High-Speed-Edge Hack Saw Blades are greatly improved, even over the MARVEL Blades which were the best on the market a few years ago. Advanced metallurgy has produced better steels; new heat treating and manufacturing techniques have brought further improvements. The only thing unchanged is the Guarantee: **THEY ARE SHATTERPROOF!**

If you haven't used MARVEL High-Speed-Edge Hack Saw Blades recently, try them on your saws for a month and see the difference a truly superior blade can mean in higher speeds, greater accuracy, lower cost per cut, and guaranteed safety to operating personnel. Your nearby MARVEL Distributor carries a complete stock of MARVEL High-Speed-Edge Blades.



Write for Bulletin CT-175 which has complete details on MARVEL High-Speed-Edge Hack Saw Blades.

ARMSTRONG-BLUM MFG. CO.  
5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.



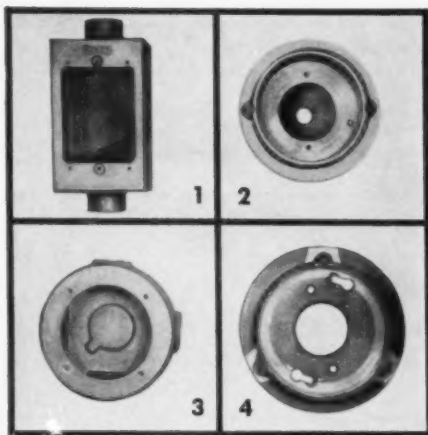


## ● **ADD SPINDLES**

AT REDUCED COST PER SPINDLE

## ● **INCREASE PRODUCTION**

AT REDUCED COST PER PIECE



**PART 1:** Spindles 3, 4, 5, 14, 15, 16

**PART 2:** Add Spindles 2, 7, 10, 12

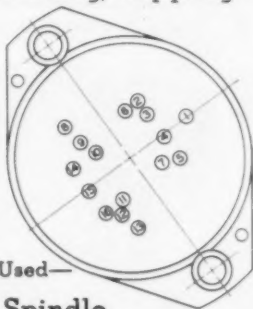
**PART 3:** Add Spindles 9, 11

**PART 4:** Add Spindles 1, 8, 13

This simple illustration proves Zagar's point—that production is in direct proportion to number of spindles used. With the Zagar gearless principle, holes on any center can be drilled reamed or tapped. With fixed center heads, you eliminate many hazards of drilling by other methods. Yet you get a flexibility unmatched by any other equipment.

Write for cost details on print "B-6".

When Using ZAGAR  
FIXED CENTER HEADS for  
Drilling, Reaming, Tapping



When  
16 Spindles  
to Produce  
4 Pieces Are Used—

• Cost Per Spindle

REDUCED 50%

• Cost Per Piece REDUCED 66%



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**ZAGAR, INCORPORATED**

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**TOOLS FOR INDUSTRY and SPECIAL MACHINERY**

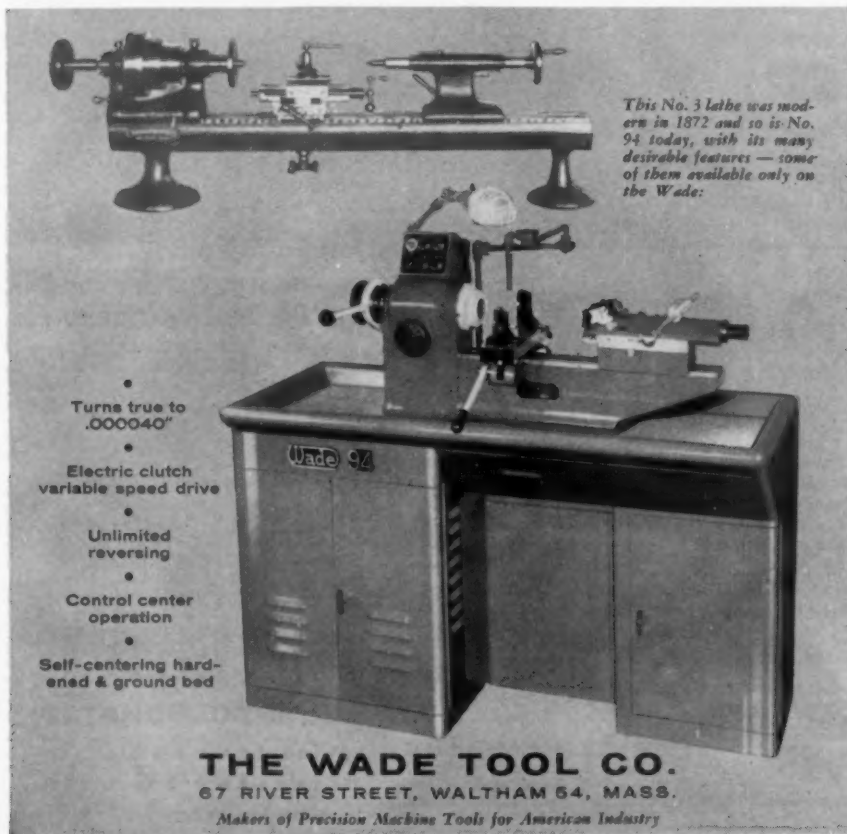
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# 1872 . . . . . 1959

## **Wade** LATHES have always met the standards of the times

There's a real plus-factor for the user, in the long life and business continuity of the builder of a machine tool. The tool always has the original manufacturer behind it . . . to fulfill a guarantee, to supply parts and accessories, to see that it continues to operate and make money for the owner.

If you're interested in knowing more about this well-designed, modern lathe, with more than 86 years of integrity behind it, write for our new brochure on the **Wade No. 94 Lathe**.



*This No. 3 lathe was modern in 1872 and so is No. 94 today, with its many desirable features — some of them available only on the Wade:*

- Turns true to .000040"
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- Unlimited reversing
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- Self-centering hardened & ground bed

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*Makers of Precision Machine Tools for American Industry*

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The Lapmaster Polishing Stand is ideally suited for polishing work pieces prior to inspection . . . in the experimental mechanical laboratory...and for small run polishing jobs.

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DIVISION

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Just Pull Out . . . for Replacement of New Polishing Surface.



No Looseness . . . in Polishing Surface.



Always Taut . . . Eliminates Dubbing of Work Edges. Large Capacity Chamber. Holds 50 Yd. Roll of Paper.



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# Reader's Guide



JUNE, 1959

VOL. 54-No. 6

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## *Arbitration*

## *Abrasive Cutting*

## *Machine Design*

## *Grinding*

## *Casting Layout*

## *Automation*

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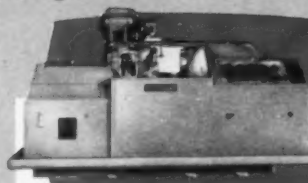
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# CLEVELAND

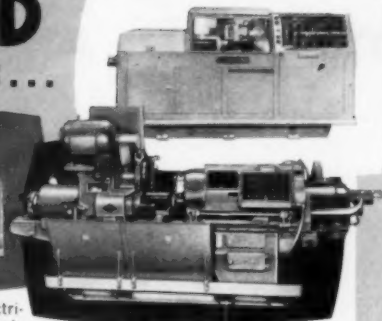
## Single Spindle Automatics ...

### MODEL AB

DIALMATIC  
Capacities:  
1½", 1¾", 3",  
4", 5"



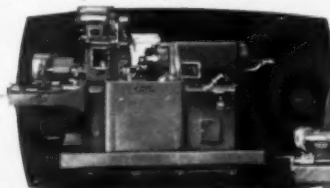
Fast, flexible, easy to set up! Electrically controlled, infinitely variable feeds are set by turning dials. On 1½" and 1¾" sizes, turret feeds and spindle speeds are electrically controlled.



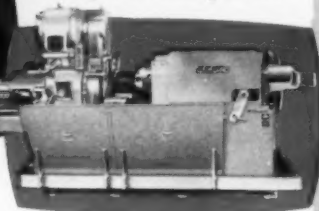
each a champion in cutting costs of your turning and forming work!

### MODEL AW

AUTOMATIC  
Capacities:  
2½", 4",  
5"

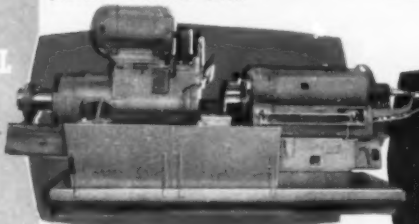


Simple, rugged, accurate! Differs from AB design in that variable turret tool feeds are obtained through an improved mechanical drive.



### MODEL A

AUTOMATIC  
Capacity: 8"

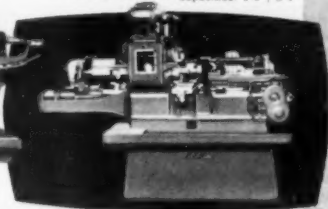


The ultimate in power and heavy-duty construction. Machines 8" stock with ease and accuracy. Universal camming saves set-up time.

For detailed information on Cleveland Automatics call a Cleveland sales engineer or write for new General Bulletin.

### MODEL B BAR AUTOMATIC

Capacities: 1½", 2½"



Tooling is mounted on a flat milling slide and on two cross slides. Ideal for work involving multiple diameters, shoulders, etc. Model B-18" handles work to 18" long.

**THE CLEVELAND AUTOMATIC MACHINE COMPANY**

**4930 Beech Street  
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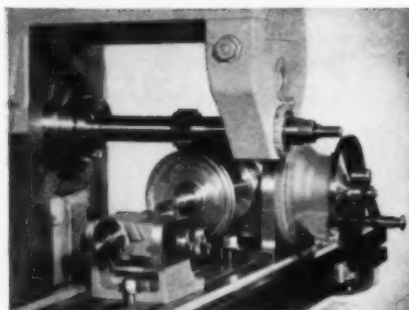
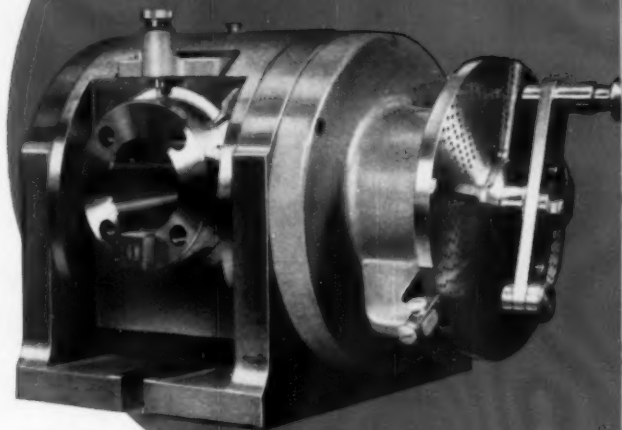
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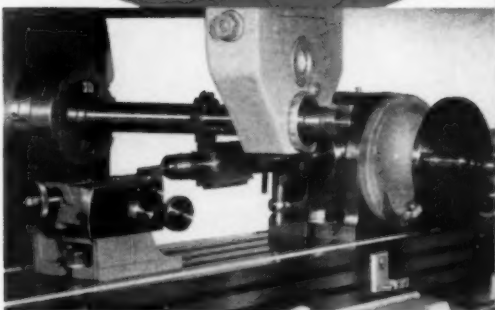
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**NOT FUSSY ABOUT THE JOB IT**  
**but mighty**



CINCINNATI Dividing Head setup on a Dial Type Milling Machine for hobbing the teeth of a worm wheel.



Milling a helical tooth gear. CINCINNATI Dividing Heads are ruggedly constructed for work of this type.

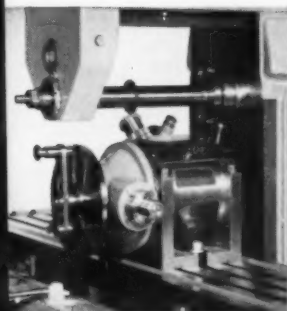
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THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO

DOES ...

particular about **ACCURACY**

CINCINNATI Dividing Heads are precision tools, versatile in both toolroom and production work.



Milling a straight tooth bevel gear by predetermining angle of roll and amount of set-over with CINCINNATI Dividing Head.

Handy man for milling machines, CINCINNATI Dividing Heads are not a bit fussy about the work assigned to them. They handle prosaic jobs like milling slots in adjusting nuts; heavy duty work like milling worms or the flutes in cutters; accurate and intricate jobs like bevel gears. Light cuts or heavy cuts, you can depend upon CINCINNATI Dividing Head's high degree of accuracy.

These illustrations are typical of the many ways in which CINCINNATI Dividing Heads can handle work in your shop. They are not restricted to universal millers; they are equally at home on plain and vertical milling machines and drill presses. And your inspectors will find 1001 uses for them in checking the accuracy of work.

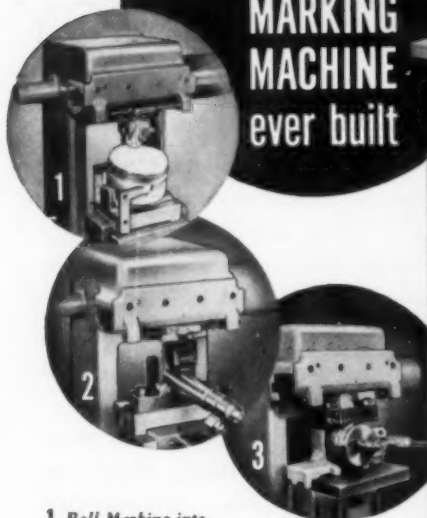
CINCINNATI Dividing Heads are built in 8", 10", 12" and 14" sizes; all have 40 to 1 ratio. Complete data may be obtained by writing for catalogs No. M-1924-2 and M-1969.

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MACHINE  
ever built



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All-Pneumatic  
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Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job faster, better, at lower cost. And remember, Noblewest Roll-Marking is *permanent marking*—good for the life of your product. Write Noble & Westbrook Manufacturing Company, 9 Westbrook Street, East Hartford 8, Conn.

*A few desirable territories open to qualified representatives*

MARK IT BEST WITH

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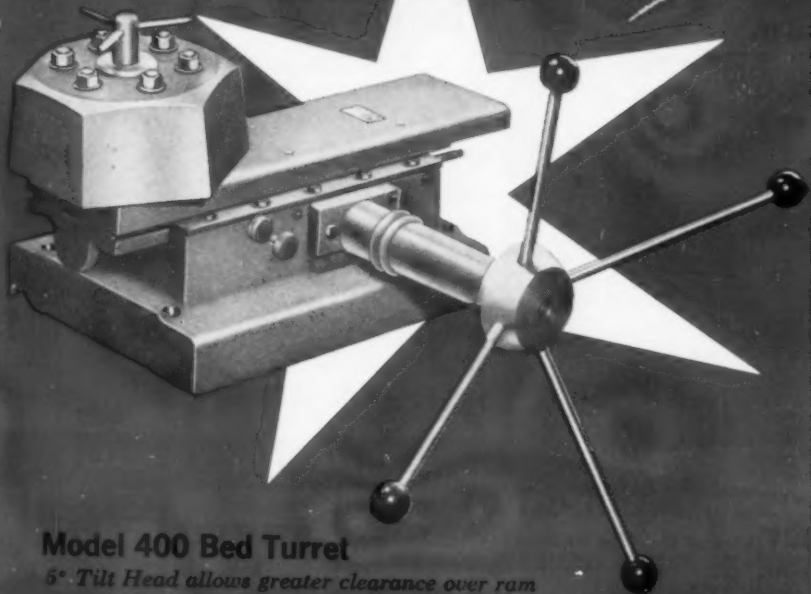


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NUMBERING  
EMBOSSING  
GRADUATING

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# AK

## BED TURRETS ...for Engine Lathes



### Model 400 Bed Turret

*5° Tilt Head allows greater clearance over ram*

Convert your engine lathe for ram-type turret lathe production with an AK Bed Turret. Self-indexing, six station heavy duty bed turret, allows full turret type operation on spindle fed bar stock. Or, turret may be used for one or more operations on individually chucked parts.

Write for price list and catalog information concerning the correct model AK Bed Turret for your lathe and production requirements.

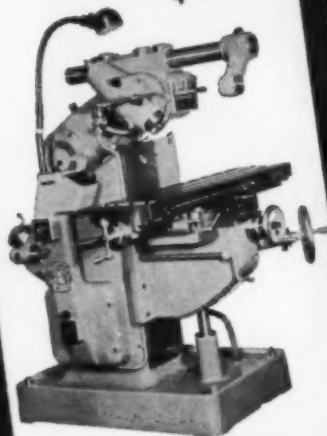
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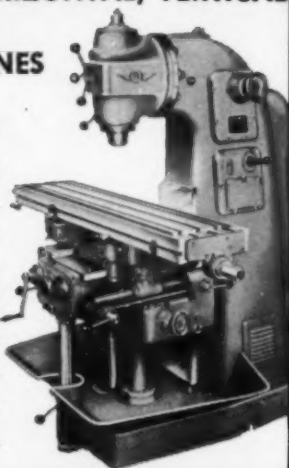
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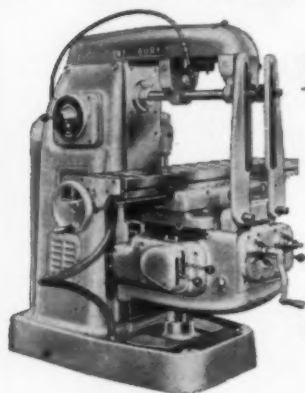
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Model	Table Size in Inches	Base Price
VPF-00	35½ x 8¾	\$1663.
VPV-00	35½ x 8¾	\$2463.
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VPU-1	51 x 12	\$3260.
VPV-1	51 x 12	\$3760.
VPF-2	61 x 12	\$6185.
VPU-2	61 x 2	\$6285.
VPV-2	61 x 12	\$6885.
VPF-4	75 x 16	\$12850.



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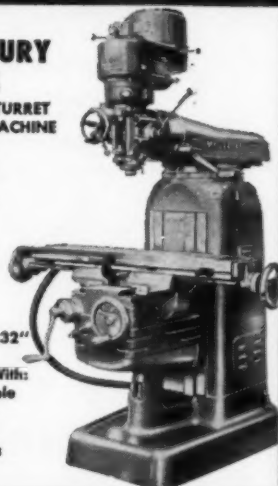
Model	Table Size in inches	Base Price
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2U	51¾ x 10¾	\$5265.
3U	60 x 12½	\$6275.
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Contour	42 x 9	\$3190.

AGENTS WANTED

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Incl. Motor  
& Controls

1½ H.P. 9" x 32"  
Table  
Available With:  
9" x 42" Table  
\$95. extra  
Coolant  
\$155. extra



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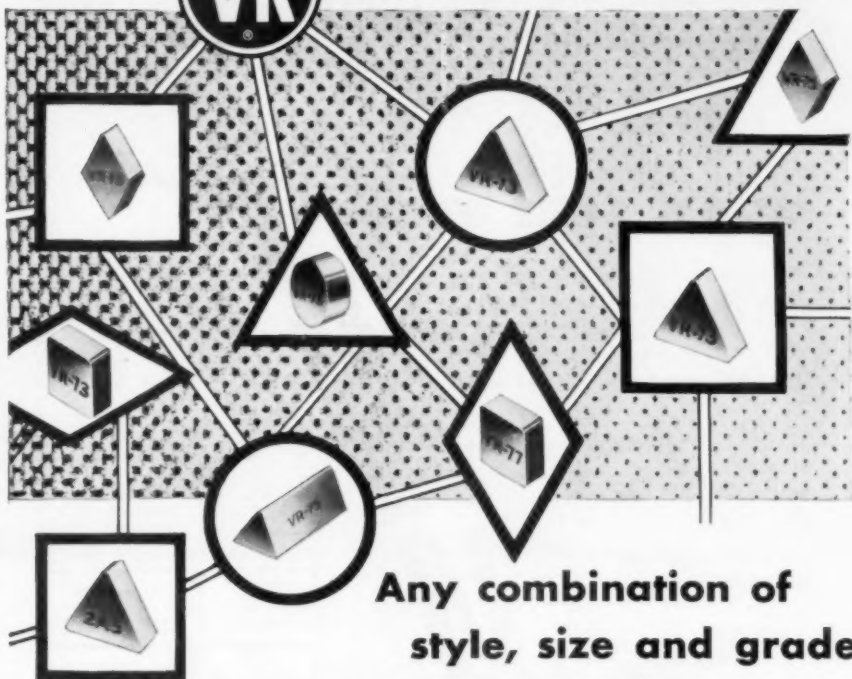
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See other Ad, Page 26



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style, size and grade  
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June, 1959

13

# NEW RANGE OF SIZES

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- RANGE: .057" to 1.130"
- 4 SETS, fully equipped with rings and measuring heads.
- READINGS IN .0001"
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All parts available separately.

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#### ● RIGHT ANGLE ATTACHMENT

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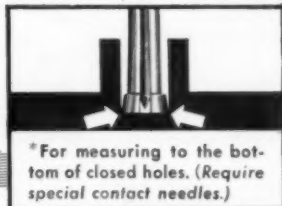
● EXTENSION RODS—may be used to length of 30" without loss of accuracy

● DEPTH ADJUSTER—used in conjunction with extension rods, permits gaging to any defined depth.

Write today, or call NEwcastle 1-8888  
for full information!

SET No.	RANGE
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E-2	.165" — .390"
E-3	.372" — .828"
E-4	.820" — 1.130"

*E-1FB	.057" — .170"
*E-2FB	.165" — .390"
*E-3FB	.372" — .828"
*E-4FB	.820" — 1.130"



\*For measuring to the bottom of closed holes. (Require special contact needles.)

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You increase operator efficiency as well as production when you use transparent, heavy-duty Sunicut cutting oils. Operators work better, because Sunicut oils let them see tools and workpieces, see the finish, see micrometer graduations.

Sunicut oils don't stain hands and clothing. They pump easily, wet metal fast, and give excellent extreme-pressure lubrication.

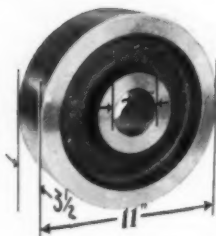
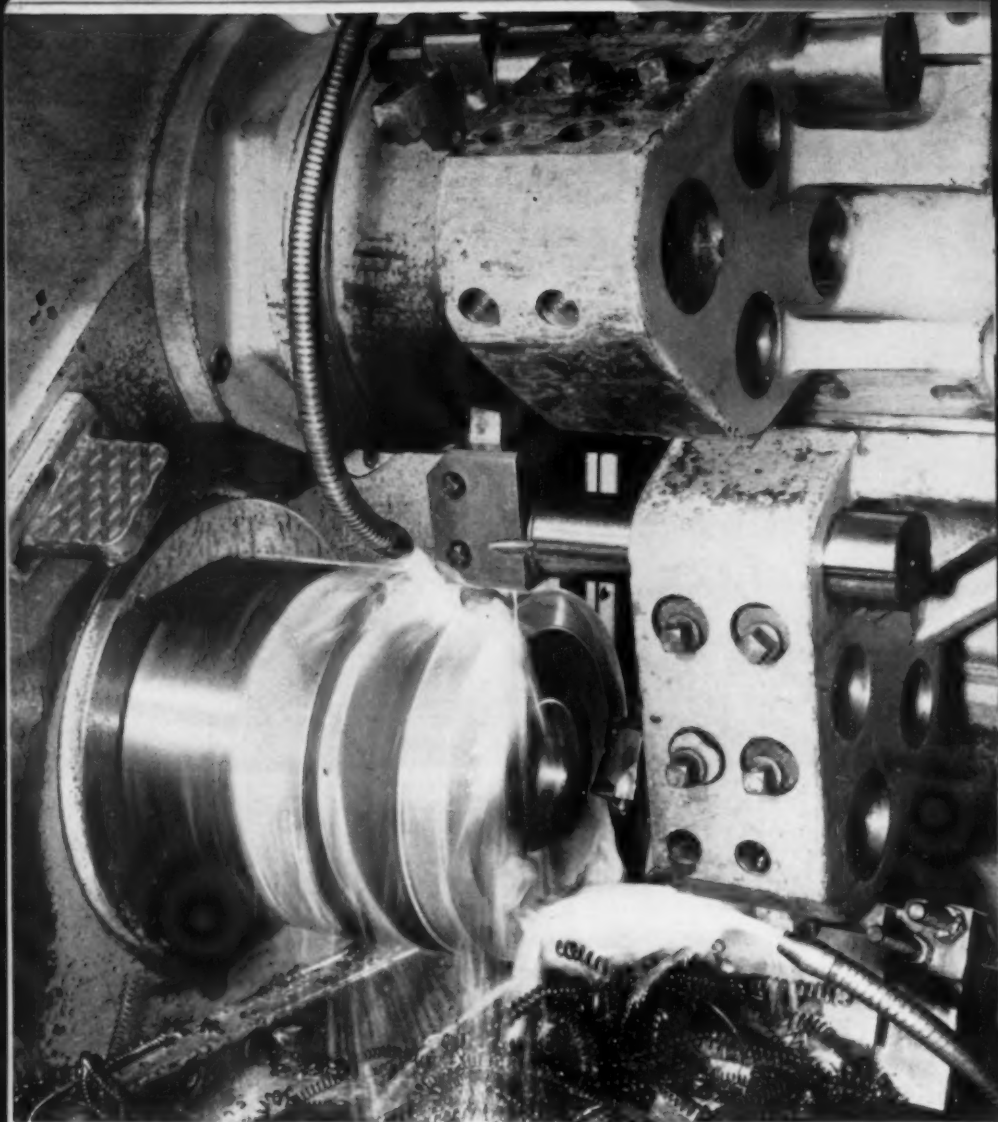
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#### **SIX OPERATIONS WERE REDUCED TO THREE**

Fairfield's old method on this part required drilling, round broaching, spline broaching and three turning operations. Now all operations except spline broaching are combined into two chucks—one on each of two 3AC machines—handled simultaneously by one operator. The result—blanking costs dropped 42%. After spline broaching the blanks are ready for machining of gear teeth. Lot sizes average about 200 pieces with frequent runs of only 25 pieces.

*At Fairfield Manufacturing Company*

Lafayette, Indiana



**GEAR BLANKING COSTS CUT IN HALF**  
**-even on Job Lots-**  
**with WARNER & SWASEY SINGLE SPINDLE**  
**CHUCKING AUTOMATICS**

Fairfield, one of America's largest independent producers of precision cut, automotive-type gears, had a production "bottleneck" in their gear-blanking department.

To increase production and still keep costs in line, particularly on the smaller lots, greater machine tool versatility was needed. Method analyses revealed that any new production equipment under consideration should be more rigid for greater accuracy—capable of using the latest in carbides for faster metal removal—and permit combining of extra operations into single chuckings through more efficient tool setups and thus eliminate costly special tooling.

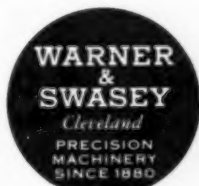
New Warner & Swasey ACs fulfilled these conditions. Ten machines—six 2ACs and four 3ACs—were installed over a

period of four years. From the start of the first pair of machines, production increased immediately, costs dropped substantially!

Fairfield's new Warner & Swasey Single Spindle Automatics provided:

- Extreme boring and turning accuracy that completely eliminated "green" grinding operations.
- Power, speed and rigidity which allowed utilization of today's most advanced cutting tool materials to their fullest capabilities.
- Unexcelled reliability which has all but eliminated downtime for other-than-normal preventive maintenance—and this based on around-the-clock operation!
- Ample tool stations (five turret and two cross slide positions) coupled with standard tooling ease and flexibility which permitted consolidation of separate operations in a single setup.

**YOU CAN PRODUCE IT BETTER, FASTER, FOR**  
**LESS...WITH A WARNER & SWASEY**



# Morse

CUTTING TOOLS



# Symbols of Service

to all metal-working  
industries

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The Morse "house emblem" and the NIDA seal are *double warranty* of the best you can get in quality and service.

For Morse-Franchised Distributors are like the tools they sell . . . tested and proven on their jobs . . . men of experience and responsibility who know how to get you top value for every dollar you spend on cutting tools.

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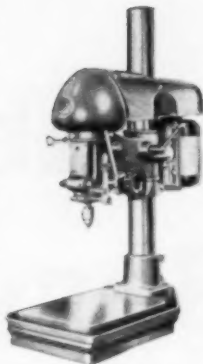
A Division of VAN NORMAN INDUSTRIES, INC.



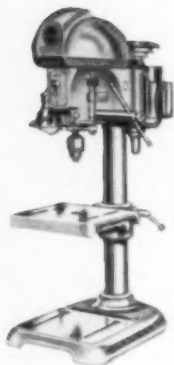
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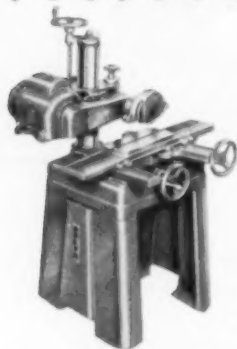
15" DRILL PRESS



14" SUPER-HI SENSITIVE



14" DRILL PRESS



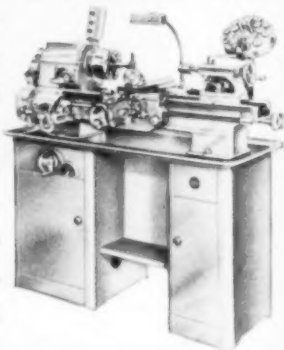
TOOLMAKER® GRINDER

Surface, Chipbreaker, Tool & Cutter



7" GRINDER

Also 6" Tool Grinder, 6" Bench



11" METAL LATHE—Also 10" and

Hand Screw Machine

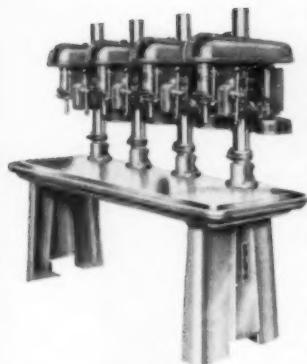
## DELTA INDUSTRIAL

### a proved way to cut

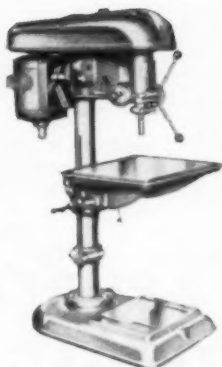
You can match the tool to your job for bigger savings—supplement or replace expensive, special-purpose machines—when you choose from the world's most complete line—53 Delta machines, 246 models, over 1300 accessories. Delta tools cost less to buy, operate, and maintain. They offer precision performance to meet exacting requirements

even under rugged, production-line use.

And because you can combine standard Delta components with automatic control devices, you can have the money-saving advantages of automation at a fraction of the usual cost. Ask your Delta Dealer about Delta "lo-cost automation"—he's listed under "TOOLS" in the Yellow Pages.



MULTIPLE SPINDLES



17" DRILL PRESS



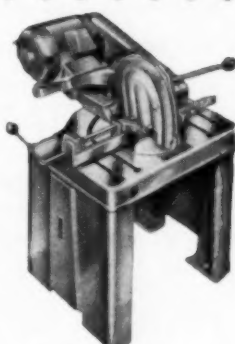
20" DRILL PRESS



14" METAL-WOOD BAND SAW  
Also 20" & 14", 20" Wood



6" ABRASIVE BELT FINISHER  
Also 12" Disc, 2 1/2" Belt Grinder



CUT-OFF MACHINE Wet & Dry  
Abrasive, Non-Ferrous & Wood

# PRODUCTION TOOLS

## metalworking costs

**FREE—Delta Industrial Catalog**

... Get all the facts on the complete line of Delta metalworking and wood-working tools and accessories. Write: Rockwell Manufacturing Company, Delta Power Tool Division, 610F N. Lexington Avenue, Pittsburgh 8, Pennsylvania.



**DELTA INDUSTRIAL TOOLS**

another fine product by

**ROCKWELL**



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HYT Size Gage, 10" model

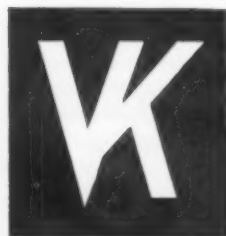
Available accessories:  
18" transfer gage  
3" and 6" riser blocks

## NEW VAN KEUREN HYT SIZE GAGE

- it embodies the well-known *Van Keuren precision*.
- it has a decided price advantage.
- permits amazing speed in setting all dimensions (a matter of a few seconds!)
- it's accurate to .000050" over entire range.
- has exclusive design features: a patented spring-loaded non-rotating spindle eliminates backlash . . . measuring surfaces are accessible from front and back . . . it can be used in a horizontal position.
- it's ruggedly built for long life.
- easily portable . . . can be used anywhere in shop.

**Now you can more quickly inspect** drill jigs, lathe fixtures, gears, cams, splines, profiles, contours . . . and check many shop operations. You can easily set precision depths on drill presses, milling machines, jig borers, etc.

*Write today for descriptive bulletin.*



THE *Van Keuren* CO.  
*Since 1920*

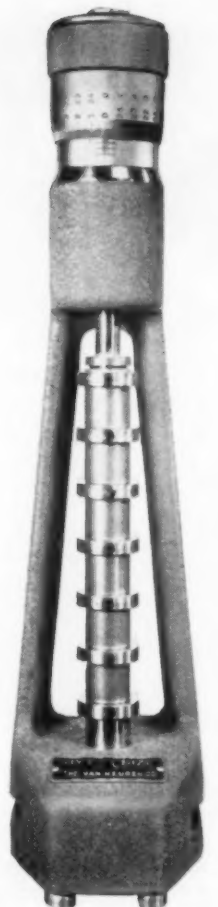
177 Waltham Street, Watertown 72, Mass.

**PRECISION MEASURING TOOLS**  
... rated the world's most accurate

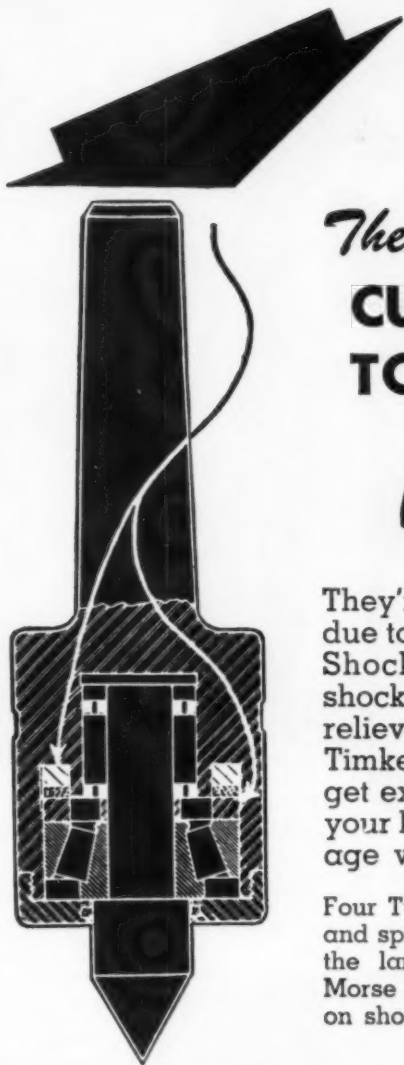
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MACHINE and TOOL BLUE BOOK



PAT. NO. 2,713,208



## *These Shock Absorbers* **CUT TOOL BREAKAGE**

*Glenzer*  
**PRECISION CENTERS**

They're cushioned to absorb shock due to heat expansion in machining. Shock breaks tools. Soak up the shock and you reduce tool breakage, relieve excessive pressure on the Timken annular roller bearings. You get extra dividends in longer life for your live centers and less work spoilage with Glenzer Live Centers.

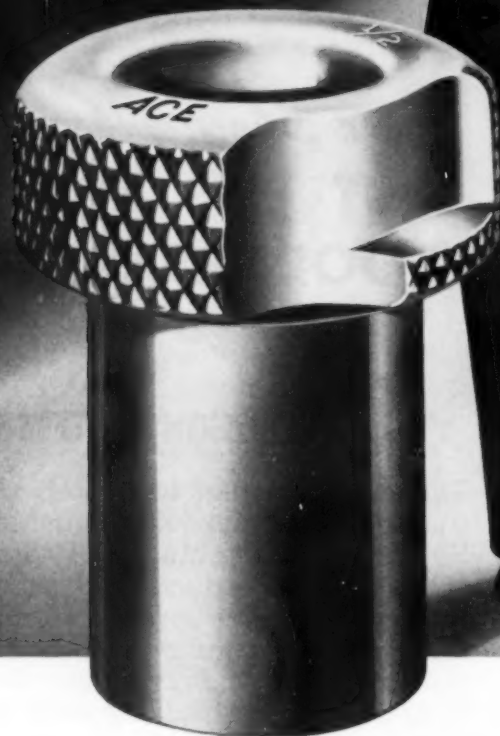
Four Types — Taper shank, slip-over, slip-in and spindle. For smallest tool room lathes to the largest railroad shop equipment. All Morse Tapers in stock. Other types to order on short notice.

**THE J. C. GLENZER CO. Inc.**

1546 E. NINE MILE ROAD, FERNDALE, DETROIT 20, MICH.

# THIS IS AN **ACE** DRILL BUSHING

*the one that outwears and outperforms!*



## IT'S GRATIFYING TO KNOW YOU MAKE THE BEST!

The man who makes Ace Drill Bushings is no Johnny-come-lately. He's not a novice. His bushings last a long, long time. That makes them cost you less.

He cares about quality. Some say it doesn't pay to build stuff too good . . . just get by . . . imply that engineers don't know the difference, but they're wrong. The man who makes Ace Drill Bushings doesn't buy that line.

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We're talking about ACE — the DRILL BUSHINGS that are superior. *Try them. You'll see.*

STOCKED, FOR IMMEDIATE DELIVERY BY LEADING TOOLING SPECIALISTS IN YOUR COMMUNITY.

## **ACE DRILL BUSHINGS**

### **NEW JERSEY**

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NEWARK 2 Mitchell 2-3006



HOME OFFICE

### **CALIFORNIA**

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# What do you want in an inclinable?

AIR FRICTION CLUTCH? MECHANICAL CLUTCH?  
FLYWHEEL OR GEARED PRESS?  
SINGLE OR DOUBLE CRANK? AUTOMATIC FEEDS?  
10 TON...200 TON?

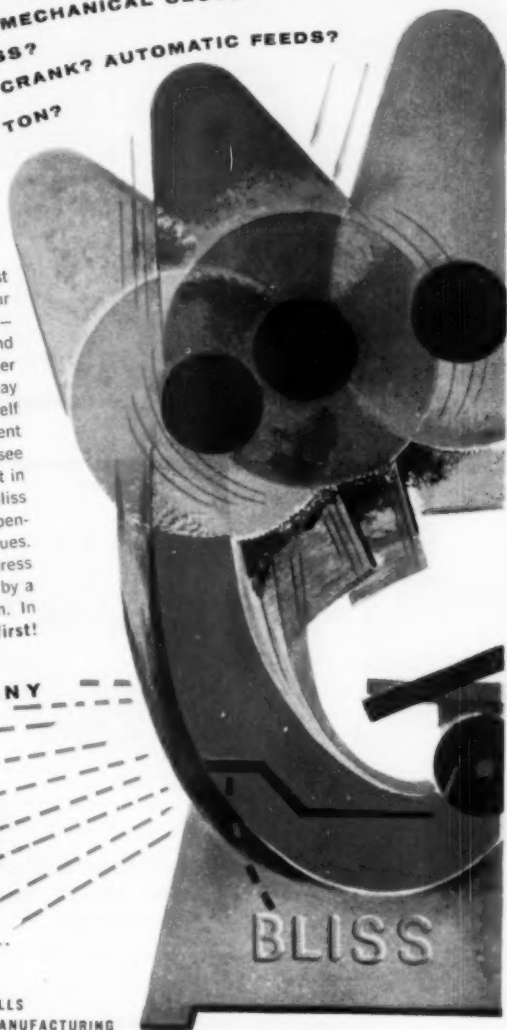
Don't settle for "second-best" when the best may cost you less! Chances are whatever your needs in an inclinable, it's a Bliss standard—simply because Bliss makes more types and sizes of inclinable presses than any other builder. In fact, someone else's "special" may be a Bliss standard. Check it out for yourself before you buy—write for our most recent inclinable catalogs and data sheets. You'll see that size for size, no matter what you want in an inclinable, you get more press from Bliss... large crankpins, long strokes, greater openings, bigger beds and many other extra values. A press that's backed by a century of press engineering... by competent counsel... by a **dependable** parts and service program. In short, you'd be wise to check Bliss—**first!**

**E. W. BLISS COMPANY**  
Canton, Ohio

**BLISS**  
SINCE 1857

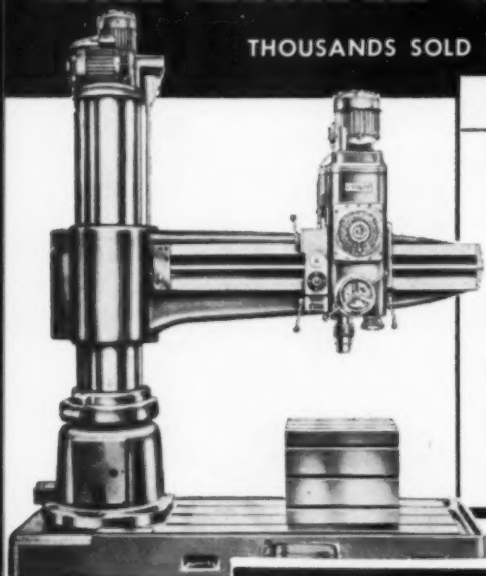
*Bliss is more than a name...  
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PRESSES • ROLLING MILLS • ROLLS  
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# UNBELIEVABLE VALUES!... IMPERIAL RADIAL DRILLS

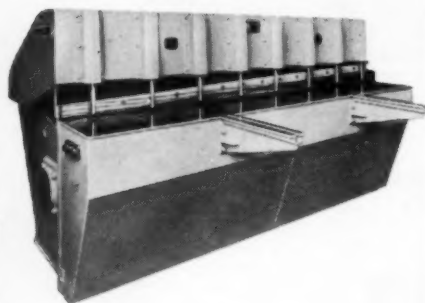
THOUSANDS SOLD TO SATISFIED CUSTOMERS!



Model	Col. Diam. Inches	Arm	Base Price
L-26	7 1/2	26"	\$1995.
L-2 1/2	8 1/2	2 1/2'	\$2085.
L-3	8 1/4	3'	\$2195.
M-3PE	10	3'	\$3995.
M-4PE	12 3/8	4'	\$4985.
M-5PE	14	5'	\$6295.
M-6PE	14	6'	\$6985.

**AGENTS WANTED**

**IMPERIAL  
WIEGER  
Guillotine  
Shears**



- ALL STEEL CONSTRUCTION
- SINGLE STROKE CONTROL
- PERMANENT ACCURACY

8" gaps on all models. Cuts thin and heavy gauge accurately.

Length	Capacity	Price
6'	10 gauge	<b>\$3595.</b>
8'	12 gauge	<b>\$4395.</b>
10'	12 gauge	<b>\$5195.</b>
6'	3/16 inch	<b>\$5190.</b>
8'	10 gauge	<b>\$5495.</b>
10'	10 gauge	<b>\$5795.</b>
6'	7/32 inch	<b>\$6190.</b>
8'	3/16 inch	<b>\$6495.</b>
10'	3/16 inch	<b>\$6795.</b>

**AARON MACHINERY CO., Inc.**

DEPT. BB 45 CROSBY ST., N. Y. 12 • WA 5-8300

BRANCHES AT:

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MINEOLA, N.Y. LOS ANGELES, CA  
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see other Ad, Page 12

# Cost-Cutting-

A SIMPLE  
MATTER OF  
SELECTION



COUNTERBORE SETS



INVERTED SPOT  
FACERS



COUNTERBORES—

COUNTER SINKS,  
HOLDERS, PILOTS



FLOATING TAP  
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CARBIDE TIPPED TOOLS



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TIPPED BROACH SECTIONS



INVOLUTE SPLINE  
SHELL TYPE BROACHES

Since 1921, Continental has specialized in cost-saving cutting tools, producing design innovations in hardened, high-speed tool steel, carbide and special-alloy cutting materials.

Job-tested in the toughest proving ground—Ex-Cell-O's own machine tool and precision parts production lines—CTW Cutting Tools come to you ready to increase the output of even your best machines!

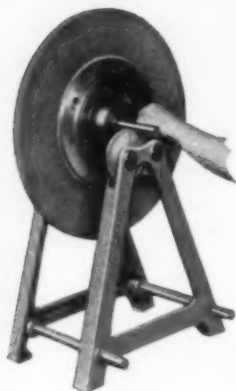
See your local Ex-Cell-O Representative, or write direct to Continental Tool Works Division for full details. In Canada, contact Colonial Tool Co., Ltd., Windsor.

Continental **TOOL WORKS**  
DIVISION OF

**EX-CELL-O**  
CORPORATION  
DETROIT 20, MICHIGAN

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# Balance...



## ROTATING PARTS

### *Faster...Easier*

*Supersensitive* Anderson Balancing Ways will static-balance rotating parts easier, faster, more accurately. No setup, no leveling, no centering. Glass-hard spindles and bearings prevent wear or ball-bearing indentations when balancing heavy work. Superior accuracy lasts throughout long life. Proved and preferred over 40 years.

## Anderson

### HAND SCRAPERS

Anderson Hand Scrapers are: (1) faster cutting, (2) easier to use, (3) just the right spring, (4) palm fitting grip, (5) 18"-20"-22" lengths. Saves costly regrinding.

**\$6.75** (18") with high speed blades

**\$9.85** (18") with carbide-tipped blades

**\$1.75** for rubber bumper shown below



Write for Bulletin 6-5

**ANDERSON BROS.  
MFG. CO.**

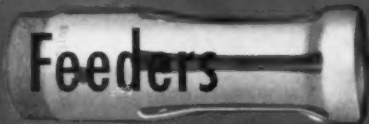
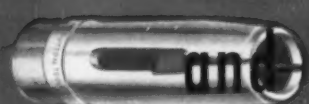
Rockford, Illinois

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why our  
company  
specifies —



1

Suttons run true  
and hold true;  
modern and ex-  
clusive method of  
heat-treating  
assures uniform  
temper and tension!

*The Source  
for ALL  
Work-holding  
Devices!*

2

Suttons have the  
famous "Diamond  
Grip" serrations;  
grip tighter,  
reduce spoilage  
and clean  
themselves!



3

Suttons are  
precision ground  
inside and out;  
they are properly  
hardened, drawn,  
and stress relieved;  
and, their accurate  
threads give  
true alignment!

4

Sutton designs  
special work-hold-  
ing devices to  
our needs; Sutton  
has facilities to  
hold tolerances,  
and produce at  
scheduled deliv-  
eries; Sutton  
gives us items at  
competitive prices.

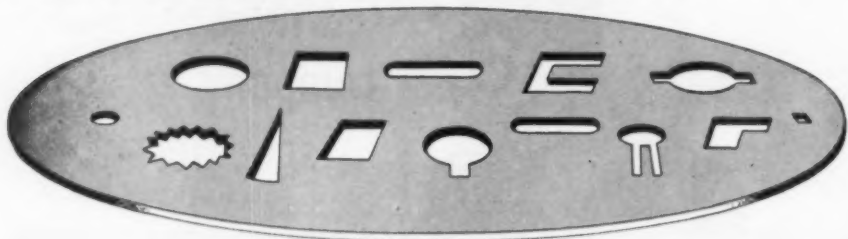
**Immediate Delivery!**  
**Sutton Tool Co.**

Sturgis, Michigan

Dept. MTE-6.

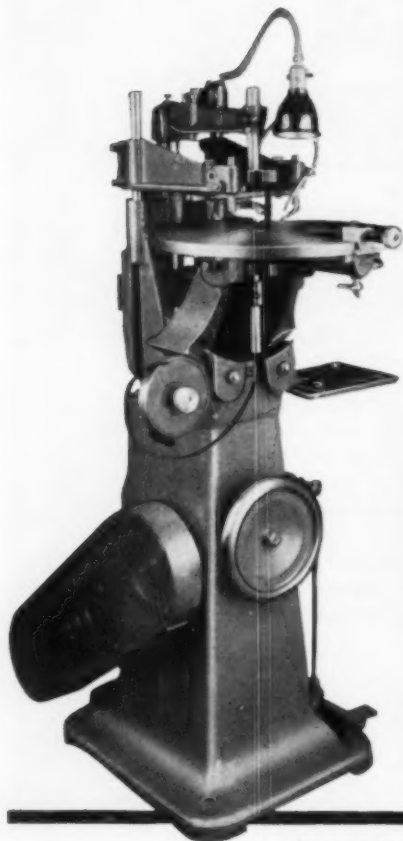
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## FOR CONTOURS LIKE THESE . . .



Freak contours — more conventional shapes — internal or external forms. In any case, you'll save valuable time by producing the job on an Oliver of Adrian contour sawing and filing machine.

Parts for jigs and fixtures, dies, gages, templates and special machine production can be shaped to dimension faster — easier — at less cost. No hand filing or semi-finishing operations. Better investigate Oliver today. Just write. Available in five sizes — bench or pedestal.



**OLIVER of ADRIAN**

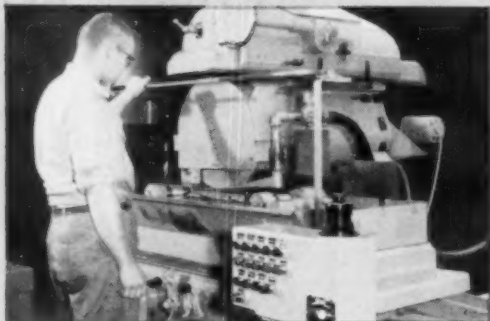
OLIVER INSTRUMENT COMPANY

1408 E. Maumee St. • Adrian, Michigan

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# Thompson

**TRUFORMING CUTS COSTS 66%  
... DOUBLES PRODUCTION AND IMPROVES PRODUCT  
AT THE OLIVER CORPORATION**



In the production of ledger plates, used in the cutter bar of mowing machines, The Oliver Corp. of Chicago, formerly first milled the teeth, then hardened the plate. The hardening process caused distortion and variance in uniformity which impaired the cutting action of the bar.

On the advice of Thompson engineers, a Type 88 Truforming Grinder with a 2½" width grinding wheel was installed to process these ledger plates as a finished grinding operation. The plates are now heat treated first and the teeth are then formed by grinding.

The installation of the Thompson Truforming Grinder has accomplished the following results:

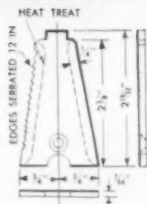
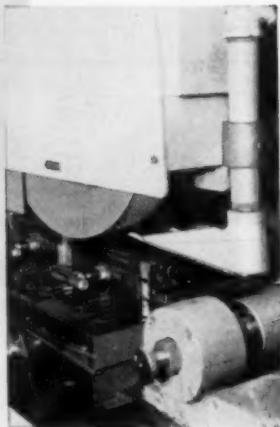
1. Cut total production costs from \$3.18 to \$1.06 per 100 pieces.
2. Increased the production rate from 1600 to over 3600 pieces per 8-hour shift.
3. Provided constant uniformity in the workpieces.
4. Eliminated the full-time service of one man.\*
5. A pair of \$160.00 milling cutters formerly produced 20,000 pieces. A \$60.00 grinding wheel now produces well over 40,000 pieces.

The leadership of Thompson Truforming Grinders results from 25 years of research and development work in crush form grinding. Today these machines are opening up hundreds of practical, time-saving, profit-improving and cost-cutting applications for industry.

Thompson's engineering experience is available to you without obligation. Write for Catalog T558.

\*Automatic machine cycle allows operator time to countersink hole in plate—an operation formerly requiring one man's full time.

**THE THOMPSON GRINDER CO.**  
SPRINGFIELD, OHIO



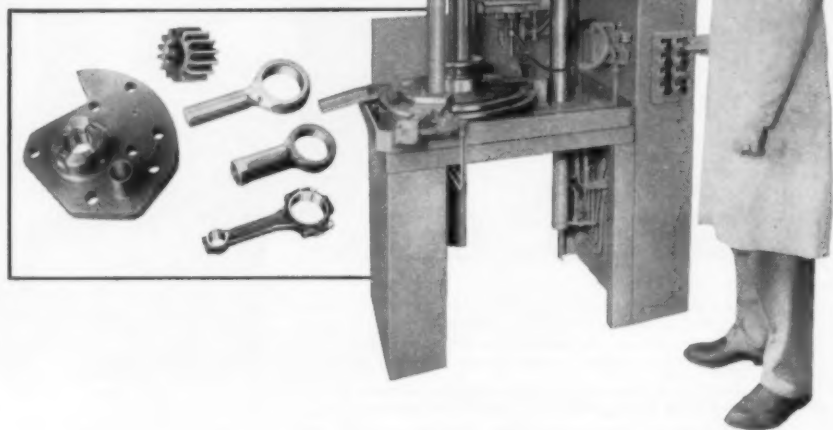
**LEDGER PLATE**  
High Carbon Manganese Steel  
Rockwell C52-58

*"Keep Thompson  
in mind for that daily grind"*



## HONE SMALL PARTS AUTOMATICALLY

High Production or Short Runs—  
with bores up to 1-1/2"



This new No. 10 series of Single Spindle Vertical Honing Machines is designed with complete automation for handling small parts with bores up to 1 1/2". These machines are small and compact in size, highly accurate, and simple to operate. They are particularly efficient and economical for honing short production runs, as well as sustained high production work.

Design features include pneumatic hone expansion with automatic rapid expansion, feed and collapse of stones; automatic bore-to-bore sizing; magazine loading and automatic ejection. Automatic shut-down is also pro-

vided as honing stones become worn. Optionally, parts may also be automatically pre-gauged, honed, post-gauged, sorted and ejected.

Powered by an all mechanical system, these machines require very little maintenance. Rigidity and accuracy are assured through suspension of the reciprocating head between two columns.

For free estimates and complete information on application to your high-production small-part finishing operations, send blueprints to Barnesdrill engineers.



### BARNES DRILL CO.

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DETROIT OFFICE: 13121 Paritan Avenue

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# OUTSTANDING RESULTS UNMATCHED ENDURANCE



## BENCO

ADJUSTABLE TENSION  
MASTER PUSHERS

Turning out millions of pieces with no feeding failure is routine with Benco Adjustable Tension Master Pushers. The simple yet unique method of adjusting and maintaining accurate tension permits you to do far better work at a lower cost.

Standard steel, cast iron, Meehanite or bronze pads may be used, BUT if you equip Benco Adjustable Tension Master Pushers with Benco solid carbide pads you have a permanent, trouble-free tool.

The savings you make by using Benco Adjustable Tension Master Pushers quickly return your cost by reduction of scrap and machine down time and by increase in production. Buy a set for your automatics now and see how much more . . . how much better they do.

Descriptive literature and prices available upon request.

Patent No. 2,833,545

## BENCO

COLLET MANUFACTURING CO.

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CLEVELAND 14, OHIO

# YOU CAN MAKE ALL TH on any Di-Acro Bender

Bar or tube, flat, angle or channel—you can bend anything bendable easily, accurately and quickly to the shape you want. And duplicate to die-accuracy too!

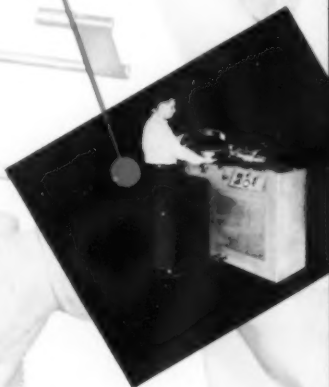
You'll find bending is superior to many forming and joining methods in the strength, function and appearance of the finished part—and best of all it's usually the lowest cost method.

A variety of standard radius accessories for forming bar, tube and flat stocks are available from factory stock. Specialized radius accessories such as those required for forming angle, channel and extruded shapes can often be made up in your own shop or a nearby job shop.

Often turning out just *one* "impossible" job can make your Di-Acro Bender worth its weight in gold . . . and you'll be able to handle *hundreds* of different bending jobs on your Di-Acro Bender! Available in hand or hydraulically powered models.



Use the postage paid coupon on the adjoining page . . . send for your free copy of "It's Easy to Bend" with more than 30 pages of how-to-do-it helps and information on Di-Acro Benders.



# E BENDS AT LOW COST

IT'S EASY  
TO BEND...



EYES



CIRCLES



ZERO RADIUS



SCROLLS



SQUARES



SPRINGS OR COILS



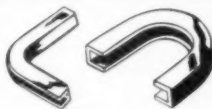
LOOPS AND SPIRALS



TUBE MATERIALS



EDGEWISE



CHANNEL MATERIALS



ANGLE MATERIALS



SPECIAL SHAPED  
MATERIALS



SPECIAL SET-UPS



WIDE MATERIALS



pronounced die-ack-ro

Please send me complete specifications on Di-Acro Benders and my free copy of "It's Easy To Bend".

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_



DI-ACRO BENDER NO. 1

Material capacity of 3/16" round steel bar and 5/16" diameter steel tubing. Radius capacity 2". Weight 22 lbs. To 750 bends/hr.

DI-ACRO BENDER NO. 1A

Material capacity of 5/16" round steel bar and 1/2" diameter steel tubing. Radius capacity 6". Weight 55 lbs. To 750 bends/hr.

DI-ACRO BENDER NO. 2

Material capacity of 1/2" round steel bar and 3/4" diameter steel tubing. Radius capacity 9". Weight 130 lbs. To 250 bends/hr.

DI-ACRO BENDER NO. 3

Material capacity of 3/4" round steel bar and 1" diameter steel tubing. Radius capacity 12". Weight 215 lbs. For large radius bends in heavy materials.

DI-ACRO BENDER NO. 4

Material capacity of 1" round steel bar and 1 1/4" diameter steel tubing. Radius capacity 12". Weight 250 lbs. For bending heavy materials where high production is not a factor.

DI-ACRO HYDRA-POWER  
BENDERS

Materials capacities to 3/4" round steel bar and 1 1/2" diameter steel tubing. Radius capacities to 24" and more. Bends as fast as operator can load the machine.

## BUSINESS REPLY CARD

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### FIRST CLASS

Permit No. 13,  
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Lake City, Minn.

**O'NEIL-IRWIN MFG. CO.**

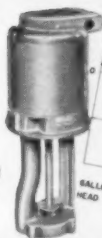
314 EIGHTH AVENUE

LAKE CITY, MINNESOTA

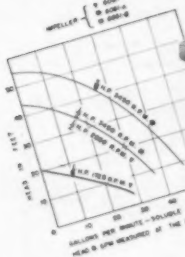
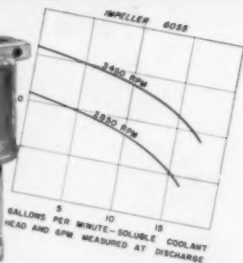
## Machine tool builders know...

### No matter what size ...

Yes, there is a Ruthman Gusher Coolant Pump that will exactly fit your coolant pump requirements from the P-3 Series (Baby Gusher) with 1/10 H.P. to the largest 7½ H.P. Series. Gusher Pumps are available in Immersed, Pipe Connected, Flange Mounted and Tank Units.



Model 6-P3  
1/10 H.P.



Model 9050  
¾ H.P.

### You get better results ...

You can be sure that Gusher Coolant Pumps will give you year after year of highly satisfactory service. Their simple, compact design reduces maintenance to a minimum and the electronically balanced rotating assembly increases bearing life, cuts vibration and wear.

## with a RUTHMAN GUSHER COOLANT PUMP

Follow the leading machine tool builders and specify Ruthman Gusher Coolant Pumps on your metal cutting machinery.



Model 6-P3 Pump in Tank No. 1-4800 equipped with Casters for complete portability

Write for our complete catalog today.

## MACHINERY CO.

# THE Ruthman

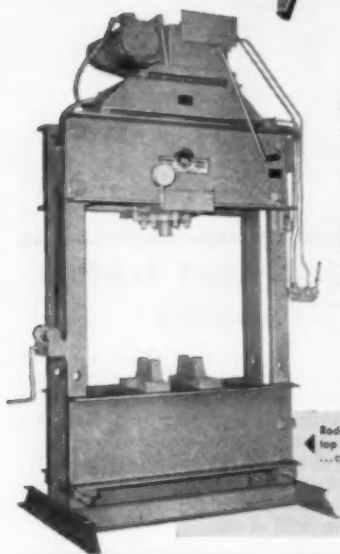
1816 READING ROAD

CINCINNATI, OHIO

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- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

# A *Rodgers* Shop Press is **BEST** for **YOU!**

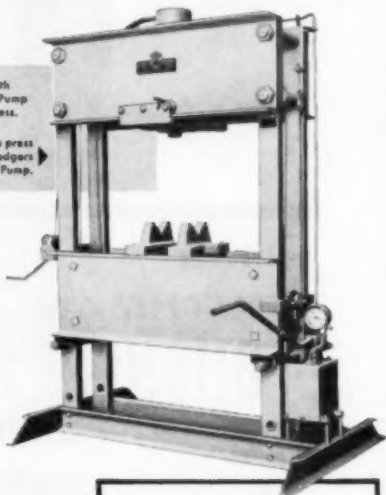


← Rodgers 100 ton shop press with top mounted Greenlee Power Pump ... cylinder travels width of press.

→ Rodgers 100 ton shop press with Rodgers 2 speed Hand Pump.

## HERE'S WHY:

- **LONGEST RAM TRAVEL** with maximum hydraulic power throughout entire stroke.
- **REMOVABLE CYLINDER** for independent hydraulic power away from the press.
- **CYLINDER TRAVEL** full width of press, either way.
- **OPEN ENDS** allow long pieces to extend through sides of press.
- **EXTRA WIDE** inside work space to handle bigger jobs more easily.
- **GREATER STRENGTH** with heavy bar stock sides and pins—bearing blocks support bolster to give uniform distribution of pressure.



**W**HEN YOU INVEST in a shop press it is more important to compare performance than initial cost!

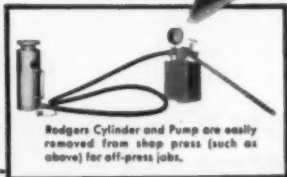
Rodgers Shop Presses are designed and built for the most versatile service, and longest trouble-free life. In the shop they handle hundreds of diversified jobs... pressing, bending, straightening, assembling. For field work the Rodgers cylinder and pump are easily removed from the press, making an ideal portable power unit for jacking, lifting, heavy shaft removal and similar work.

Rodgers produces the most complete line of shop presses available—capacities from 60 to 400 tons—in varied standard models with power pumps, top mounted or placed at the side—or hand pumps with 2 or 3 speeds.

When you compare shop press performance and cost you will find a Rodgers is best for you, too. Ask your Rodgers Representative for complete details—or write us.

**SEND FOR NEW CATALOG . . .**

*It gives useful information and complete specifications.*



Rodgers Cylinder and Pump are easily removed from shop press (such as above) for off-press jobs.



**RODGERS HYDRAULIC, Inc.**

**Pioneers in High Pressure Hydraulics Since 1932**

7453 WALKER STREET • MINNEAPOLIS 26, MINNESOTA

Use postpaid card. Circle No. 226

MACHINE and TOOL BLUE BOOK





# You can keep **2365** ..... **BEARINGS and BARS** **IN YOUR DESK DRAWER!** .....

Let your local Bunting Distributor carry your bearings inventory. Hundreds of Bunting Distributors and Eleven Bunting Branches supply from stock the most advanced, highest quality bearings, completely machined and finished, at low cost anywhere in America.

## .. where to get them

Your Bunting distributor is listed in the classified section of your telephone directory usually under Bars—Bronze, and Bearings—Bronze. Two Bunting factories and eleven Bunting Branch Warehouses expedite distribution in all areas. Ask your local Bunting distributor or write for catalogs.

## .. made to blueprint

Bunting offers unmatched engineering and manufacturing facilities for special bearings and parts of Cast Bronze and Sintered Oil-filled Metals.

The Bunting Brass and Bronze Company  
Toledo 1, Ohio  
Evergreen 2-3451



ask or write for your copy of...

Bunting's "Engineering Handbook on Powder Metallurgy" details manufacture and use of sintered metal bearings and parts.



CATALOG NO. 58 listing... 866 sizes of Bunting Cast Bronze Standard Stock Bearings. 667 sizes of Bunting Sintered oil-filled Bronze Stock Plain, Flange and Thrust bearings. Made to ASTM Standards. 267 sizes of Bunting Cast Bronze Tubular and Solid 13" Bars. 84 sizes of Bunting Sintered oil-filled Bronze Tubular and Solid 6½" Bars.



BAR CARD 40 listing... 138 sizes of Bunting Bearing Aluminum 13" Bars.



CATALOG NO. 258 listing... 343 sizes of Electric Motor Bearings for all makes and sizes of electric motors from 1/50 to 100 HP.

# Bunting®



BEARINGS, BUSHINGS, BARS AND SPECIAL PARTS OF CAST BRONZE OR SINTERED METALS. ALCOA® ALUMINUM BARS.

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MACHINE and TOOL BLUE BOOK

*For Longer Life...  
Less Kerf... Best Non-Ferrous Cutting*

# SIMONDS HARD RIM SAW

This Simonds solid saw (new to the market) has already made a *solid* hit! The men who have to get the work out are sold on the Simonds "Hard Rim's" longer cutting life between sharpenings . . . the better finish it imparts to the non-ferrous metals and plastics it cuts so smoothly . . . the minimum kerf as against non-solid saw cutting. Yes and everyone likes the Simonds "Hard Rim" because of its non-shattering safety when run at high speeds and the protective advantages to personnel.

This very true cutting saw is available in diameters of 8" to 18". Try it out — call your Simonds Distributor!

For Fast Service  
from  
Complete Stocks  
Call your  
**SIMONDS**  
Industrial Supply  
DISTRIBUTOR



**SIMONDS**  
SAW AND STEEL CO.

FITCHBURG, MASS.

Factory Branches in *Evans, Chicago, Shreveport, La., San Francisco and Portland, Oregon*  
Canadian Factory in *Montreal, Que.* Simonds Division, Simonds Steel Mills, *Lakeland, N. Y.*  
Heller Tool Co., *Newark, N. J.* Simonds Abrasive Co., *Phila., Pa.* and *Alexia, Que., Canada*

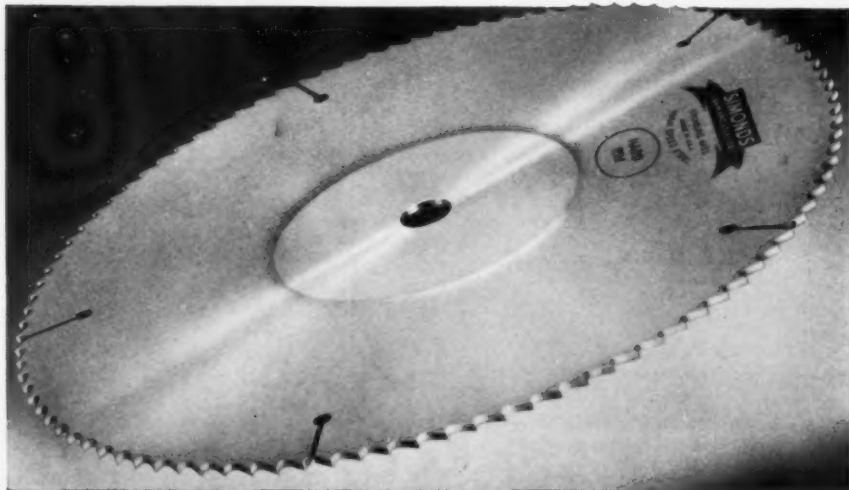


## QUICK FACTS

**Saw Rim** — Made very hard for unparalleled resistance to abrasion and wear

**Saw Body** — Made just hard enough to keep the saw cutting straight

**Resharpening** — Easily done on standard saw grinding equipment



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## \* YOUR W-T DEALER— the plus value you get with...

Your Walker-Turner dealer is a good man to know better. On his staff are specially-trained men who know metalworking from "A" to "Z"—men who have the experience and ability to assist you with any tooling problem you might have. And these metalworking experts are ready, willing and able to provide complete, engineered set-ups to best meet your specific needs.

There are other reasons to call on your Walker-Turner dealer when you're in the market for metalworking tools. He offers a full line of rugged, versatile, low-cost W-T "Light-Heavyweights" that have proved their superiority in plants all over the country—he maintains a large inventory of new machines and spare parts—and his entire organization is built to give fast, personalized service (otherwise he wouldn't be a W-T dealer).

If you haven't as yet experienced the benefits of doing business with your Walker-Turner dealer, why not give him a call soon. He's listed under "Tools" in your classified telephone book.



### FREE CATALOG

Write to Walker-Turner Division, Rockwell Manufacturing Company, Dept. WF-23, 400 N. Lexington Ave., Pittsburgh 8, Pa.



13" Drill Press

**W** WALKER-**T**

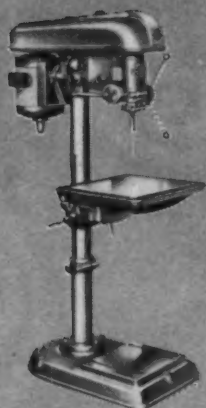


14" 8-Speed Band Saw



6" Bench Grinder





17" Drill Press



20" Drill Press

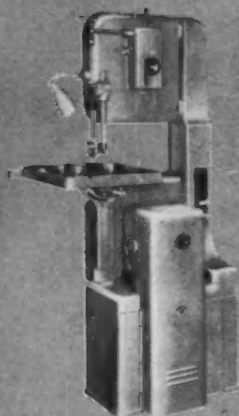


Radial Drill



Cut-off Machines

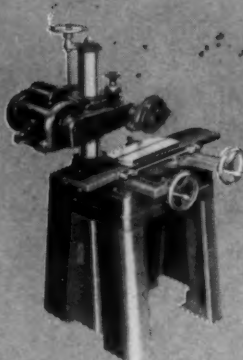
# TURNER "LIGHT-HEAVYWEIGHT" MACHINE TOOLS



16" Variable Speed Band Saw



20" Variable Speed Band Saw



Surface Grinder



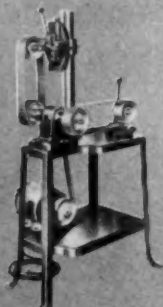
6" Tool Grinder



7" Standard Grinder

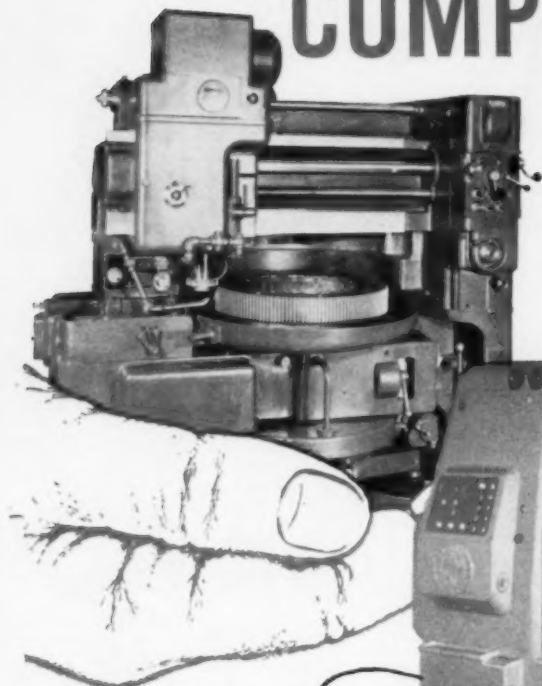


Belt and Disc Sander



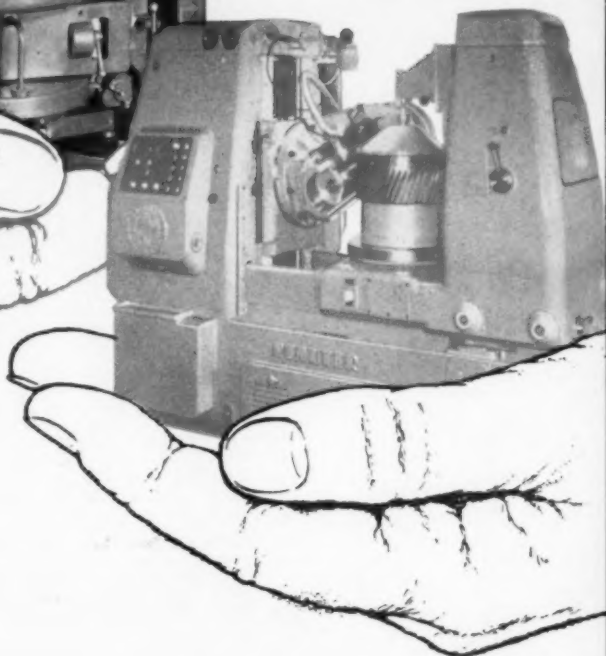
2 1/2" Belt Grinder

# PERFECT COMPLEMENTS



*Fellows 36-Type  
Gear Shaper*

*Pfauter P 400  
Gear Hobbing Machine*



THE  
PRECISION  
LINE

... ✓ **FELLOWS GEAR SHAPERS!**  
✓ **PFAUTER GEAR HOBBERS!**

Now Fellows sells, and later will manufacture, the world-famous  
Pfauter Gear Hobbing Machines and Worm Milling Machines.

Fellows Gear Shapers and Pfauter Gear Hobbers provide complete coverage of modern gear production equipment needs. Both operate on the molding-generating principle. The Pfauter Hobbers embody every important advance in hobbing technique, in most cases originated by Pfauter. And Fellows Gear Shapers incorporate every major advance in gear production by the Gear Shaper method originated by Fellows.

Among the many features incorporated in Pfauter Hobbers are the differential for helical gear hobbing, the hydraulic backlash eliminator for efficient climb hobbing, the fully automatic plunge for longitudinal and radial-tangential hobbing and, most recently, exclusive Pfauter DIAGONAL Hobbing. Capacities of Pfauter machines range from 3" max. P. D.,  $2\frac{3}{4}$ " max. face width, to 120" max. P. D.,  $1\frac{1}{4}$  D. P. and 30" max. face width.

With the addition of the Pfauter line, Fellows provides the most comprehensive service possible in the field of gear production equipment. Your Fellows representative can give you full information about our machines and instruments which cover every phase of gear production.

THE FELLOWS GEAR SHAPER COMPANY  
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Branch Offices: 1048 North Woodward Avenue, Royal Oak, Mich.  
150 West Pleasant Avenue, Maywood, N. J.  
5835 West North Avenue, Chicago 39  
6214 West Manchester Avenue, Los Angeles 45

***Fellows*** Gear Production Equipment

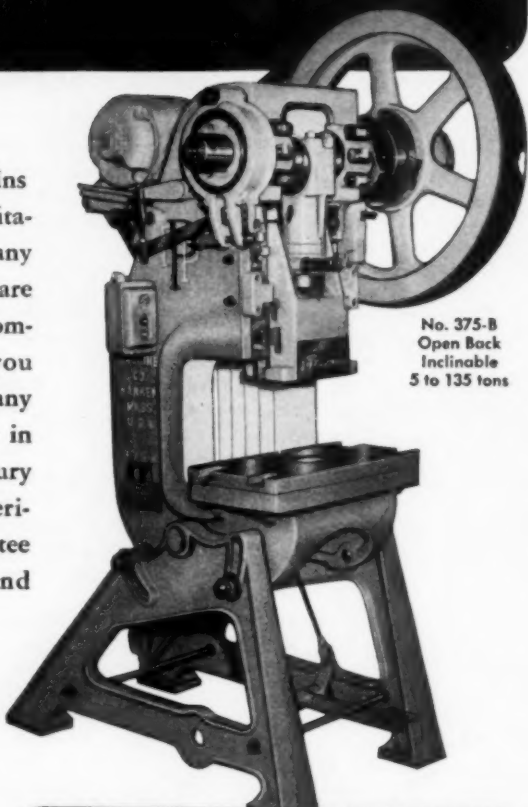


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PERKINS PRESSES  
24 HOURS a DAY  
FOR YEARS!"**

Dollar for dollar, Perkins Presses offer you more profitable production hours than any press on the market. They are extremely Powerful, Economical, Versatile and offer you more for your money than any other press on the market in its price range. Half a century of building presses for American Industry is your guarantee of Quality, Economy and Service.

**Write Dept. BB3**

*for descriptive literature  
or engineering service.*



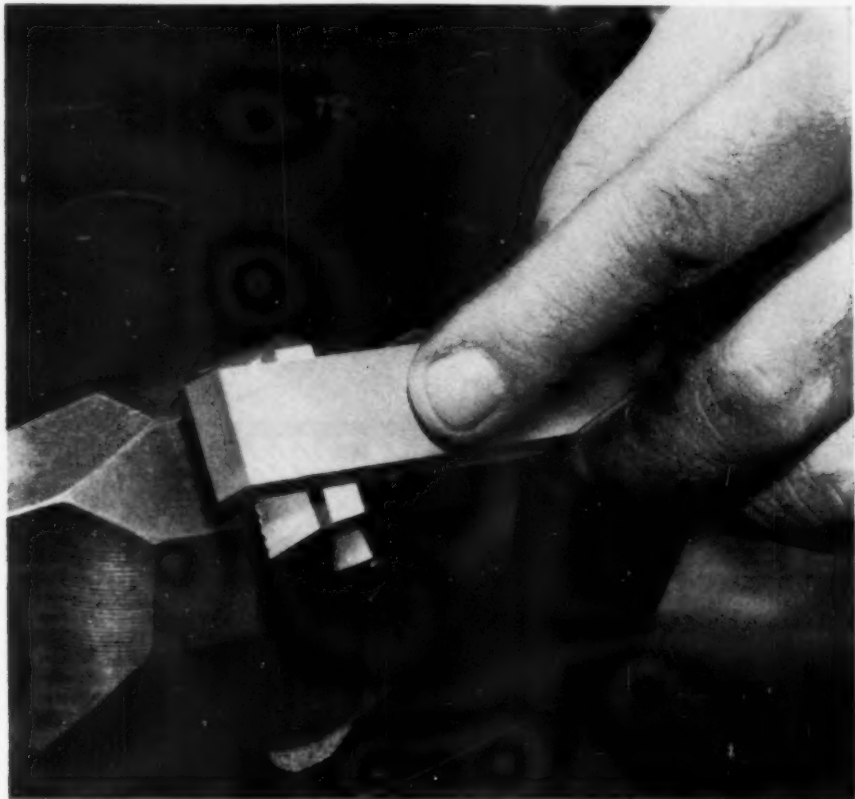
No. 375-B  
Open Back  
Inclinable  
5 to 135 tons

**PERKINS**  
**MACHINE COMPANY**  
WARREN, MASS., U.S.A.

## for the toughest tool steel . . .



Hand stoning with INDIA® or ARKANSAS oilstone files is the choice of master mechanics for maintaining sharper cutting edges on lathe bits, millers, drills . . . and for deburring, chamfering, radiusing, and fitting of delicate parts.



**BEHR-MANNING CO.** TROY, NEW YORK  
A DIVISION OF NORTON COMPANY



BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes  
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals  
In Canada: Behr-Manning (Canada) Ltd., Brantford. For Export: Norton Behr-Manning Overseas Inc., Troy, N. Y., U.S.A.

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## **A**re you machining when you should be swaging?

There's no profit in chips, especially when you can save material, time, investment and labor costs by swaging. Rotary swaging has become the modern production method for reducing, pointing, tapering, sizing, assembling, bonding and forming ID contours with production tolerances to within  $\pm .001$ . Swaging improves physical characteristics, permits control of wall thickness, and eliminates finish grinding in many cases. Write today for the new Fenn Swaging Catalog. It may prove an eye-opener toward doing a better job on your product.

**FENN** ROTARY  
*Swaging Machines*

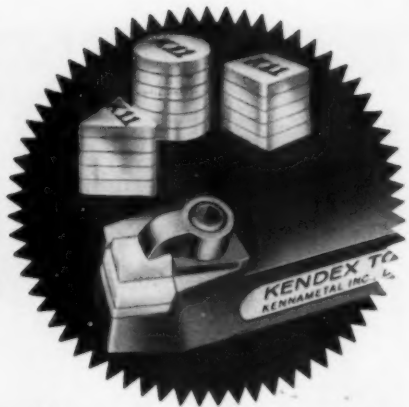
FENN MANUFACTURING CO. • 904 FENN ROAD • NEWINGTON, CONN.

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# KENNAMETAL\*

# K11



**A specialty grade  
in 1955 ... a production grade today**

Created four years ago to provide the greatest possible resistance to abrasion, K11 soon demonstrated exceptional performance in finishing and light roughing of cast iron, alloyed cast iron, brass, bronze, and light alloys. Today, under certain conditions, K11 is also being used for light cuts on steel, as well as for machining unfired ceramic materials, resin materials, and plastics.

With a hardness of 93.0 Rockwell A, K11 is particularly suitable for such precision operations as boring brake drums, machining cam shafts, finishing pistons and sleeves. It is also recommended for die inserts for compacting ceramics, abrasive wheels and other applications involving severe abrasion.

Here are a few examples of K11 "success" stories from many varied applications:

**A. Turning SAE 1213 steel rotors** . . . At 298 sfm (2550 rpm), K11 increased pieces per insert from 750-1000 to 7500-9000.

**B. Machining cast iron** . . . K11 averaged 11.7 pieces with .008" wearland. Best competitive carbide could produce only 9.7 pieces with .016" wearland. K11 performance thus represents a 3 to 1 improvement.

**C. Machining Fiberglass missile parts** . . . in tests, K11 provided 15% greater tool life than the best of three other makes of carbides. K11 has now been used continuously on this job for over a year.

**D. Finish facing modular iron flywheels** . . . K11 increased output from 30 to an average of 100 pieces per cutting edge.

**E. Boring welded bracket of 1020 steel** . . . K11 is producing 70% more pieces per cutting edge at 100 sfm, .020" depth and .002" feed.

**K11 is now available from stock  
... at stocked grade prices**

Due to outstanding performance on these and many other difficult jobs, demand for K11 has increased rapidly. To meet this growing popularity, K11 inserts are now available from stocks at Kennametal plants in Latrobe and Detroit. Triangular, square and round inserts with negative rake; also square and triangular inserts with positive rake are being stocked and are available at stocked grade prices, Group II.

For more information about this hard Kennametal grade, see your Kennametal Representative or write Kennametal Inc., Latrobe, Pa. 8799

\*Trademark



INDUSTRY AND  
**KENNAMETAL**  
... *Partners in Progress*

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## Are you getting your 19 minutes?



Recent studies prove the average manufacturer operates at a profit only during the last 19 minutes of every working day.

What happens to the rest of the day's output? According to the National Association of Manufacturers, it goes to pay the costs of doing business.

Think what this means to manufacturers attempting to produce profitably with obsolete equipment...with machining unavoidably representing a large part of the manufacturing cost.

The thin line between profit and loss in your operation can well hinge on your taking advantage of modern, high-speed machine tools with ample power, reserve feeds and speeds, and maximum flexibility.

If you have obsolete equipment in your shop, now is the time to look at it closely and critically. The difference between the old and the new may amaze you. Find out now just how much obsolete machines are holding you back.

Why not call in your Gisholt Representative and talk it over with him? He'll give you fair and accurate appraisals of any machine's productive output. Call him today.



**Gisholt MASTERLINE  
Saddle Type Turret Lathe**

Rugged headstock gear train provides 24 different forward speeds—all from a single-speed motor, for full power on all cuts.

Hydraulic speed selector permits effortless speed shifts without stopping spindle or shifting gears.

Here's a rugged, powerful machine that delivers maximum output and accuracy from today's carbide tools—and has ample reserve to meet tomorrow's tooling requirements.

Contact your Gisholt Representative today for full details.

# GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

**ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW-MACHINE GUARANTEE**

Gisholt Machine Company  
Madison 10, Wisconsin

- ☐ Send Saddle Type Turret Lathe Literature.  
☐ Have Gisholt Representative call.

Name.....Title.....

Street Address.....

City.....State.....

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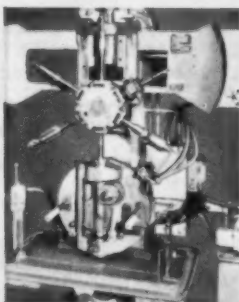
# "Roticul" Parts Machined BURGMASTER automatic hydraulic



Roticul Rotary Tiller is only one of the many power garden tools built by Simplicity Manufacturing Co., Port Washington, Wisconsin. Others include Wonder-Boy Riding lawn mowers, garden tractors, cultivators, spray equipment, etc.



Cast iron Roticul Rotary Tiller parts now machined three times faster on the Burgmaster Turret Drill over former turret lathe operation.



Close-up showing large carbide tipped multiple boring, reaming, grooving, and spot facing tools with nylon wear strips. Not special 180° indexing fixture which is electrically safeguarded for proper index position for respective tool.

## Specialists in High Production Turret Drilling



"O" Manual  
Power Index  
1/2" Capacity



1C Manual  
Power Index  
3/4" Capacity



2B Manual  
Power Index  
3/4" Capacity



2BF Flange Mounted  
Power Index  
3/4" Capacity



2BH Automatic  
Hydraulic  
3/4" Capacity



3BH Automatic  
Hydraulic  
1 1/2" Capacity



2BR Ram Type  
Radial Drill  
3/4" Capacity



2BH-T-3BH-T Automatic  
Tape Controlled  
3/4" and 1 1/2" Capac

# 3 Times Faster . . . 6 SPINDLE TURRET DRILL

at Simplicity Manufacturing Company, Port Washington, Wisc.

Another example of good tooling on a Burgmaster Automatic Hydraulic Turret Drill pays off 3 to 1 in addition to a direct labor savings of \$.147 per part. The cast iron housing was formerly machined on a turret lathe in 6.5 minutes, and is now machined on the Burgmaster in 2.3 minutes. Twelve operations are performed by special multiple cutting carbide tools on the 6 turret spindles. The tools have nylon wear strips and are piloted in steel bushings in the 180° and 15° indexing fixture. The fixture is electrically safeguarded to assure the proper index position for the respective tool. Burgmasters are pace-setters, automatically doing the work and the thinking — requiring only loading, unloading, and starting by pressing a button.

The efficient, automatic machine functions of the Burgmaster 2BH Turret Drilling, Tapping, and Boring Machines makes possible these production improvements. The turret is power indexed, permitting skip indexing, if desired, to provide different combinations of machining cycles. Spindle speeds and feeds are pre-selected and automatically shifted for each spindle to keep tools cutting at their optimum rates. Feeds are infinitely variable and quickly adjusted from standard controls.

In addition, accurate micro adjustable depth control for each spindle is provided, and automatic rapid approach and return saves valuable machine time and speeds the machining cycle. All operations are performed at the most efficient rate commensurate with fine finish, accuracy, speed and longest tool life.

## Maximum Flexibility Is Assured

Because all machine functions are adjustable, the machine can be set up with different tools and fixtures in approximately one hour or less to produce other parts — automatically. This convenience permits some manufacturers to carry small inventories of parts.

Burgmasters may be supplied as complete production units, including fixtures and tools ready to go into production. With proper tooling, they will replace many different types of machines to effect substantial savings, increase production, and cut costs. Why not ask a Burgmaster field engineer to call? There is no obligation.

## Job Facts

**Machine:** Burgmaster 2 BH Automatic Hydraulic Six Spindle (2 H.P.) Turret Drilling, Tapping and Boring Machine.

**Company:** Simplicity Manufacturing Co., Port Washington, Wisc.

**Part:** Cast Iron Housing for Rotcul.

**Quantity:** Continuous Production.

**Fixture:** 180° and 15° Indexing Fixture Electrically Safeguarded for proper Index Position of Port for Respective Tool.

**Tools:** Special Carbide Multiple Cutting, with Nylon Wear Strips.

**Tolerances:** .001 Bearing Bores; .002 Seal Bores.

**Former Method:** Turret Lathe

**Former Time:** 6.5 Minutes

**Present Time:** 2.3 Minutes

**Savings:** \$.147 Direct Labor Per Part, Production Increased 3 to 1.

### How The Job Is Run

Operations	Diameter	Speed	Feed
1. Ruf. & Fin. Bore, Spot	1.800		
Face Bearing Bore	1.844	1300	.008
2. Fin. Ream Bore	1.8504	1300	.012
3. Machine 2 Ring Grooves in Bore — Index Fixture 15° for Tapping Hole	720		.006
4. Tap Pipe Plug Filler Hole 3/8" Index Fixture 180° for opposite end	450		.055
5. Rug. & Fin. Bore & C bore	.900, .962	1300	.008
6. Fin. Ream & Counterbore	1.362, 1.005, 1.375	720	.016

Write for bulletin describing Burgmaster 6 and 8 spindle Automatic Hydraulic Turret Drills in detail. Thirty-minute 16mm sound film showing Burgmaster turret drills in operation, including the new automatic positioning table, available from any Burgmaster office.



## BURG TOOL

MANUFACTURING COMPANY, INC.

15001 South Figueroa Street, Gardena, California  
FAculty 1-3510 DAVis 9-4158



### BURGMAS-TER DIRECT SALES OFFICES:

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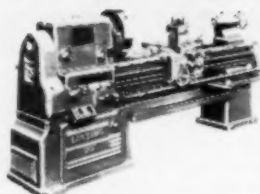
Plus dealer  
representatives in other  
industrial centers.

# **S & S** for NEW low-cost hi-precision TOOLS!



## **SPEEDMASTER RADIALS**

From  
2' to 12'

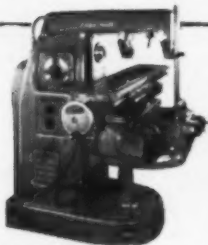


## **LANSING LATHES**

from 12" up to 180" swings  
bed lengths to order

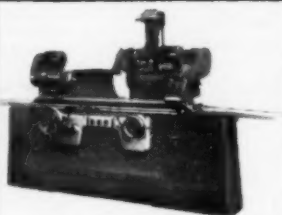
## **PERRIN-SWISS JIG BORER**

with unique  
optical system



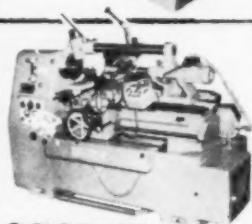
## **SUPERMILL MILLING MACHINES**

Plain — Univ. — Vertical  
all sizes



## **ELGIN GRINDERS**

Cyl. — Horiz. & Vert.  
Surface Types all sizes



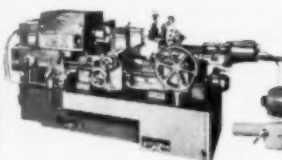
## **CICLOMATIC PRODUCTION TRACING LATHE**

Two sizes — 18" and 24"  
swings



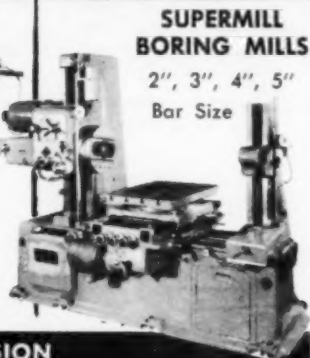
## **MAN-AU-CYCLE**

World's Fastest  
Threading Lathe  
— all sizes



## **MINGANTI TURRET LATHES**

Ram, Saddle &  
Automatic Models



## **SUPERMILL BORING MILLS**

2", 3", 4", 5"  
Bar Size

Write Today  
for Detailed  
Specification  
Brochures

## **NEW EQUIPMENT DIVISION**

# **S & S MACHINERY COMPANY**

135 53rd STREET  
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6945 BANDINI BOULEVARD  
LOS ANGELES 22, CALIF.  
Raymond 3 9231

# LUCAS plus "N. P. C."

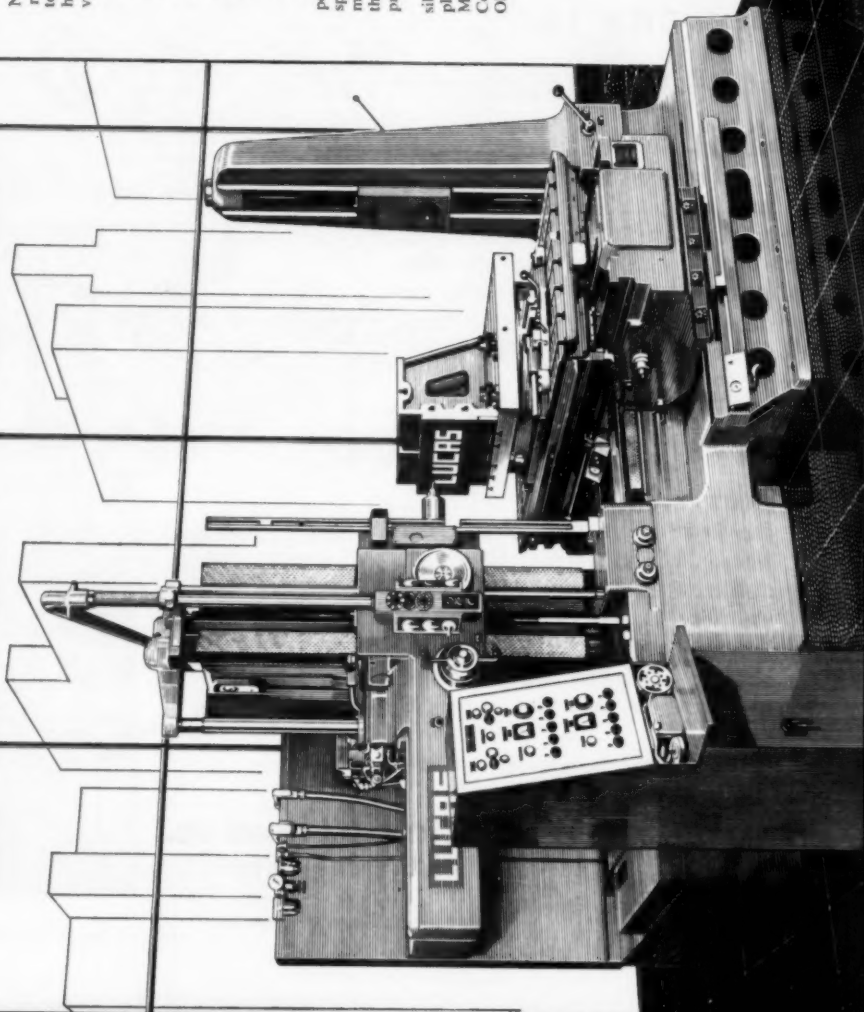
Numerical Positioning Control on any Lucas machine presents advantages that contribute to more production, greater efficiency and a higher degree of accuracy. The individual advantages are as follows:

- Reduces direct and indirect labor
- Eliminates jigs and fixtures
- Eliminates scrap
- Controls production
- Improves quality
- Reduces inventory
- Reduces floor space
- Reduces tool costs
- Simplifies engineering methods
- Makes new methods possible
- Eliminates the human error

On all Lucas machines with N.P.C., the point to point positioning and changes of speeds and feeds may be controlled by manual selection of the decade switches on the console as well as by punched tape programming.

It will pay you well to investigate the possibilities which this combination offers in your plant. For complete information, write Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

**LUCAS**  
OF  
**CLEVELAND**





# dependable...

## *Whiton* **HARDENED PLATE CHUCKS for** *High Precision Work*

In high-precision, low-cost turning operations the **right** chuck for the lathe and the job is of utmost importance. Whiton's Independent 4-jaw chuck — with more than 100 years experience behind it — features jaw slots formed by separate plates hardened and finish ground **before** mounting on the chuck body.

## *The Right Chuck*

### **FOR THE JOB!**

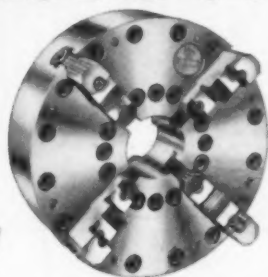
The **Right** Chuck for the job is a Whiton! Whiton hardened plate type chucks available from 8" to 18" diameter for American Standard Spindle Noses: Types A, D, & L. Furnished with style No. 6 American Standard Tongue and groove or solid type reversible jaws.

Complete technical information available on request.



**THE WHITON MACHINE CO.**  
NEW LONDON, CONNECTICUT

Use postpaid card. Circle No. 246

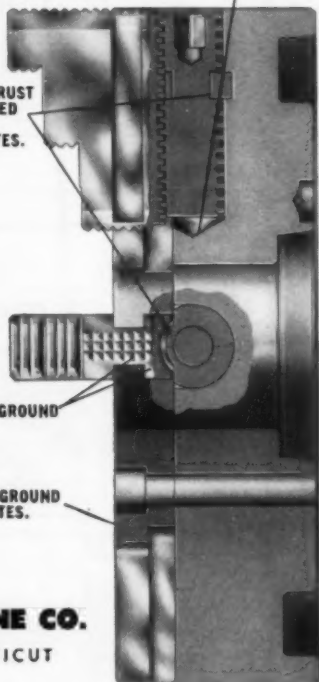


SCREW CHAMBER NOT BORED  
THROUGH TO CENTER HOLE —  
INCREASING STRENGTH OF CHUCK BODY.

FULL CIRCLE THRUST  
BEARING RETAINED  
IN BODY BY  
SEGMENTAL PLATES.

HARDENED AND GROUND  
JAW SLOTS.

HARDENED AND GROUND  
SEGMENTAL PLATES.





# The New



interchangeable with all  
standard JIC cylinders

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1½ to 8 inches, the T-J Squair Head is an interchange-

able cylinder which produces maximum force and efficiency, with minimum pressures... and is also adaptable to the use of low pressure oil as the working medium. Write today to Tomkins-Johnson, Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

## CHECK THESE 10 POINTS OF T-J SUPERIORITY

1. One Piece Piston
2. Hard Chrome Cylinder Bore and Piston Rods
3. High Tensile Steel Tie-Rods
4. Cushion Adjusting Screw, Externally Adjustable
5. New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)

6. Solid Steel Heads and Mounting Plates Standard all Models
7. Port Design Allows Minimum Pressure Drop on Inlet or Outlet
8. Chevron Type, Self-Adjusting Rod Packing
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10. Piston Rod, Extra Strong-Polished and Chrome Plated for Efficiency and Protection



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**BLANKS ON TAP**

**JUST FOR SPECIAL TAPS**

**ONE TAP OR A CRIB-FULL**

**FAST SERVICE**

**CUSTOMIZING WITHOUT DELAY  
TO GIVE YOU THE SPECIAL  
TAP ENGINEERED FOR YOUR  
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**SPECIAL HOOKS AND RAKES  
RELIEFS  
SURFACE TREATMENTS**



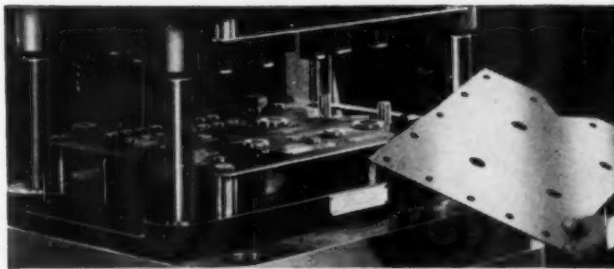
*We make normal unexpedited delivery of simple special taps within two weeks' time. If there are additional features which make for some complication, but still permit use of standard blanks, we deliver in three weeks. Special taps that have to be made from bar stock take longer but not nearly as long as you may be used to waiting.*

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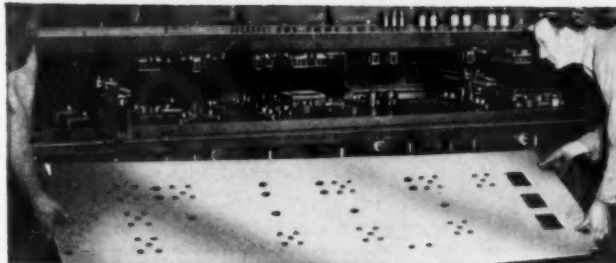
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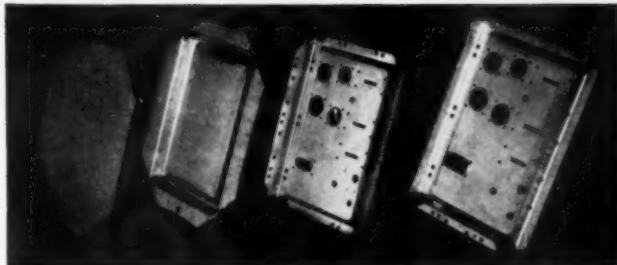
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All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



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**CUSTOM DIES**  
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Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog  
☐ More information on custom die work

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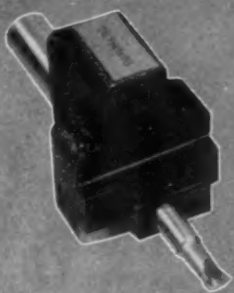
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# NEW BOKUMETHOD CUTS ACCURATE INTERNAL GROOVES



Bokum's new RT series—6 sizes in all—of recess tool holders has been especially designed for hand screw machines, turret lathes and multiple spindle automatic screw machines. The exclusive straight line dovetail motion gives accurate grooving dimensions.

Use this Bokumethod . . . a Bokumatic RT holder with standard Bokum cutting tools . . . for "O" ring and retaining ring grooves, back chamfering, thread recessing and special internal forming.

Write Dept. H for complete information.



TRADE MARK REG. U.S. PAT. OFF.

## BOKUM TOOL CO. INC.

14775 Wildemere Ave., Detroit 38, Michigan

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## How Allison Wheels help you get Quick, Accurate Cuts on Any Material, Any Shape

• Abrasive cutting can give you *cleaner* cuts, *faster*—on almost any material from titanium to fire brick. But only with the proper cut-off wheel can you get best results. That's where your ALLISON-CAMPBELL Field Engineer can help. He can select the ALLISON wheel to cut metals and other hard materials at speeds of just a few seconds per square inch—fine finish, no burn, with little or no burr—accuracy within close tolerances. There's an ALLISON wheel for every abrasive cutting job.

**Resinoid bonded wheels** • for dry abrasive cutting at speeds of 3 to 5 seconds per sq. in.  
**Rubber bonded wheels** • for wet cutting of

all types of steel, alloys, titanium, glass, plastics. **Masonry cutting blades, including reinforced types** • for wet and dry cutting of fire brick, concrete block, tile, other building materials. **Fiberglass reinforced wheels** • for extra strength on many foundry jobs.

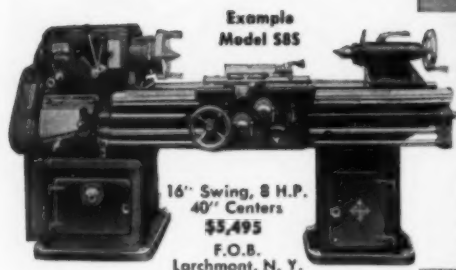
**GET THE COMPLETE STORY!** • Write for Bulletin DH-214 for detailed information on abrasive cutting and wide selection of ALLISON wheel specifications. ALLISON wheels available 3" to 34" diameter, .006" to 3/16" thick. And remember—your ALLISON-CAMPBELL Field Engineer can give you specialized help. Specify ALLISON wheels for efficient, accurate, economical cutting.



# ALLISON ABRASIVE CUTTING WHEELS

Allison-Campbell Division • American Chain & Cable Company, Inc.  
 937 Connecticut Avenue, Bridgeport 2, Conn.

Use postpaid card. Circle No. 251



Example  
Model S85

16" Swing, 8 H.P.  
40" Centers  
\$5,495  
F.O.B.  
Larchmont, N. Y.

Weight ..... 4800 lbs.  
Spindle Speeds ..... 18  
Feeds & Threads ..... 76  
Spindle Bore ..... 2 1/2"

*Flame Hardened Bedways Optional*

Superb  
Swedish  
Engineering  
**KOPING**  
**LATHES**

Realistically

Priced

Heavy Duty

Large Spindle Bore

Swings From 16" to 60"

For years successful manufacturers have turned out better products with KOPING Machine Tools, which owe so much to the outstanding Swedish materials from which they are made. They knew that the KOPING nameplate is not just another trademark, but is also a criterion of quality, top design and good service. KOPING has been making machine tools for more than 100 years. This continuity of service is our inspiration today as we build a bigger future for KOPING products.

Weight ..... 6100 lbs.  
Spindle Speeds ..... 18  
Feeds & Threads ..... 271  
Spindle Bore ..... 2 1/2"

*Flame Hardened Bedways Standard*



Example  
Model S88

16" Swing, 15 H.P.  
40" Centers  
\$7,990  
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Larchmont, N. Y.



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KOPING • SWEDEN

*Homestrand, inc.*

Our representative in USA:  
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the VOLVO Family

One  
**PROFIT  
PICTURE**  
after another  
—with  
**SPIRAL  
POINT\***

That's because Spiral Point transforms a standard twist drill into a cost-reducing, precision tool!

On this Link, a manufacturer of hydraulic equipment **ELIMINATED TWO MACHINING OPERATIONS**—the result of Spiral Point's self-centering action!

Previous method required spot milling, drilling and reaming undersize, then a final grind after heat treatment.

A Spiral Point drill grind of 118° point angle held tolerances consistently, leaving only finish grinding.

Convert the twist drills in your plant to precision Spiral Points with the Cincinnati **SPIROPOINT® DRILL SHARPENER**

—automatically applies this new point geometry in a matter of seconds.

Ask your CL&T Dealer, or write us direct.

**SPIRAL POINT PERFORMANCE REPORT**  
(Return to Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio)

Company: [Redacted]  
Address: [Redacted]  
Job Description: Part Name Universal Link  
(Show sketch including tolerances)  
Material: Alloy Steel  
Machine: Lathe  
Operator: P.M.  
Spindle Speed: 1000 rev/min.  
Feed: 0.002 in./rev.  
Coolant: Yes  
Drill Size: 3/32" Point Angle: 118° Clearance Angle: 14°  
Web Thickness: 0.004 Drill Material: HSS  
Feed: 0.002 in./rev. Mechanical ☒ Hydraulic ☐ Hand ☐  
Type of Machine: Lathe Hole Depth: 2.000 Hole Size: 0.051  
Hole Finish: Good Blind Hole ☐ Through Hole ☒  
Hole Straightness: 0.001 I.R. Hole Roundness: 0.001 (0.002" - 0.000)  
Hole: Large ☐ Small ☒ Name ☐  
—see also for comments on performance of Spiral Point  
—see plates per grind, other comparisons  
—this part

Cincinnati's new drill point geometry. You get accurate hole size—straighter, rounder, cleaner holes; eliminate secondary operations; maintain hole-positioning accuracy without costly guide bushings or pre-centering; get more holes per grind.

Improved Machining Through Research  
**CINCINNATI LATHE AND TOOL CO.**

3210 Disney Street • Cincinnati 9, Ohio

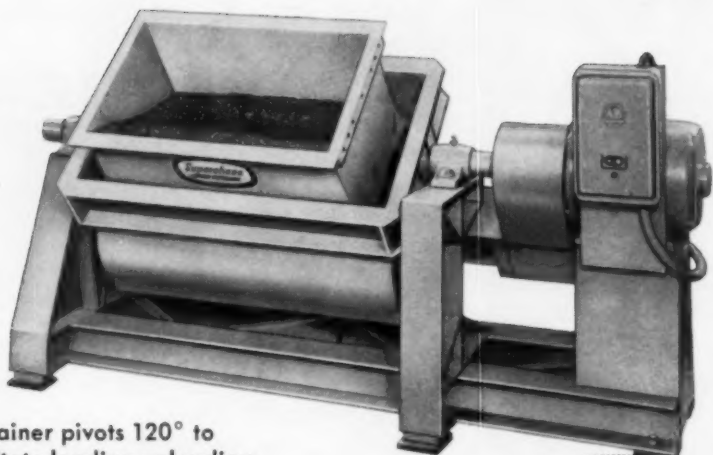
"TRAY-TOP" Lathes • "CINCINNATI" Drilling Machines

"SPIROPOINT" Drill Sharpener

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Container pivots 120° to facilitate loading-unloading.

## ALMCO Vibrasheen FINISHES FASTER!



**Constant vibratory motion . . .** that's the secret of faster deburring and finishing you now get by using the new ALMCO *Vibrasheen* Method!

This amazing metal finishing machine vibrates a full 5 cu. ft. load\* of parts and media . . . uses scrubbing action to remove burrs and finish parts in a fraction of the time required in ordinary barrel finishing operations.

The new *Vibrasheen* Method is

particularly suited for faster burr removal from parts, and finishing hard-to-reach internal crevices. Can be used for deburring, descaling, cleaning, burnishing and surface refinement.

**For full story on *Vibrasheen* Method and on processing sample parts, write for the new ALMCO Album of New Products!**

*\* Smaller and larger models also available.*

### FREE!

**NEW PRODUCT ALBUM**  
Gives full information on new Almco Super-sheen Systems. Describes new and better machines, methods and media. Write today!



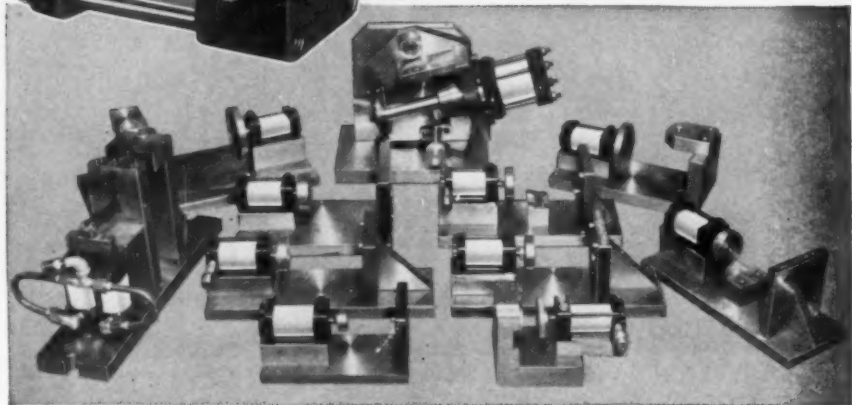
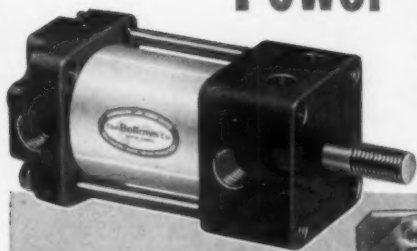
## ALMCO QUEEN PRODUCTS DIVISION

King-Seeley Corporation

46 E. Main St.  
Albert Lea, Minnesota

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## Power your fixtures this easy way



You can cut the time required to open and close fixtures by a third or more with the Bellows HAN-D-AIR cylinder. These small, compact 1-1/8" bore air cylinders develop 80-to-100 lbs. of thrust at average shop air pressures. They are easy to install on many standard fixtures and readily incorporated into special fixtures. They are so low in cost it's easier to leave them permanently on the fixture than to transfer them from one fixture to another.

Bellows HAN-D-AIR cylinders are available in 1, 2, 3 and 4" stroke lengths, in both single and double acting types. Can be mounted in any position. The 5/16" dia. piston rod is threaded for easier installation.

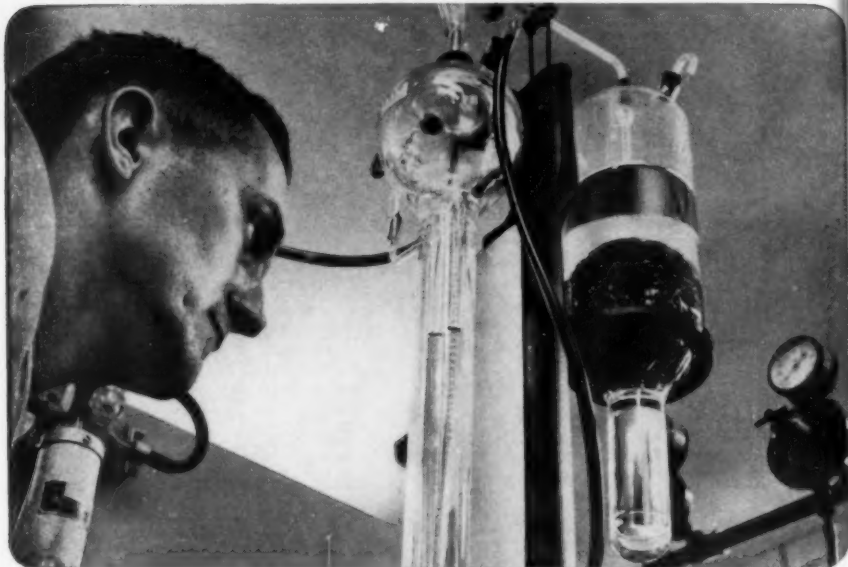
Write for information and prices on the Bellows Han-D-Air Cylinder. Address Dept. MTB-659, The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ontario.

895-B

**The Bellows Co.**  
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION  
**AKRON 9, OHIO**

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**Experience—the added alloy in Allegheny Ludlum tool steels**



QUICK, FAST TESTING for carbon content is done not once or twice but 8 times per melt in A-L's Chem Lab with this direct reading Leco carbon determinator.

## **Carbon content checked 8 times during melt to guarantee A-L tool steel hardenability**

**Lab tests for carbon eliminate your guesswork; provide high hardness, uniform hardenability, reproducible tool performance.**

Because carbon has the greatest influence on hardenability, Allegheny Ludlum watches it carefully during the melt. Testing a specimen for carbon takes only a few minutes. Therefore, A-L checks for carbon content 8 times during the melt, and makes the necessary adjustments to insure accurate control of carbon. This control means Allegheny Ludlum can hold carbon content to a closer range than most customers specify.

Carbon control at Allegheny Ludlum assures you of precise response to heat treating. This control in the melt brings you predictable, high hardness, uniform hardenability and reproducible tool performance.

This is just one of the many things A-L does to insure

high quality. Here are some others: close control over forging techniques, rigid temperature-time programming, careful testing of billets prior to processing to insure good surface and sound interior, control over annealing to give you the right hardness for your exact machining operation, thorough metallurgical testing to insure top tool steel quality and meeting of your specifications.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

**ALLEGHENY LUDLUM STEEL CORPORATION,**  
Oliver Bldg., Pittsburgh 22, Pa. Address Dept. MB-18

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### **ALLEGHENY LUDLUM**

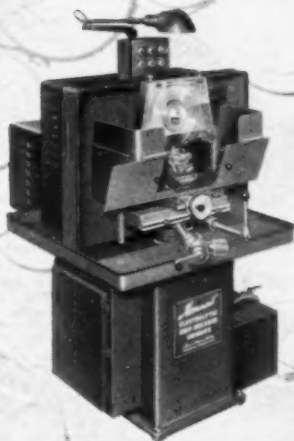
Tool Steel warehouse stocks throughout the country... Check the yellow pages every grade of tool steel... every help in using it



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MACHINE and TOOL BLUE BOOK

# Almost Unbelievable Savings in Diamond Wheel Consumption



SPECIALLY DESIGNED  
FOR THE  
ELECTROLYTIC  
PROCESS

## ...and grind easier and faster with the New *Hammond* Electrolytic Oscillating and Chip Breaker Grinders

The new Hammond Electrolytic Oscillating and Chip Breaker Grinders were designed primarily for use with the Anocut electrolytic grinding process. A controlled and precise method, the Electrolytic process removes stock electrochemically. It is not to be confused with elec-

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Combined with electrolytic grinding, these Grinders provide a tremendous advance in grinding ease, speed and cost reduction.

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In addition you are assured of uniform accurate dimensions every time, easier set-ups, and a better finish on the parts.

## ON THESE OPERATIONS



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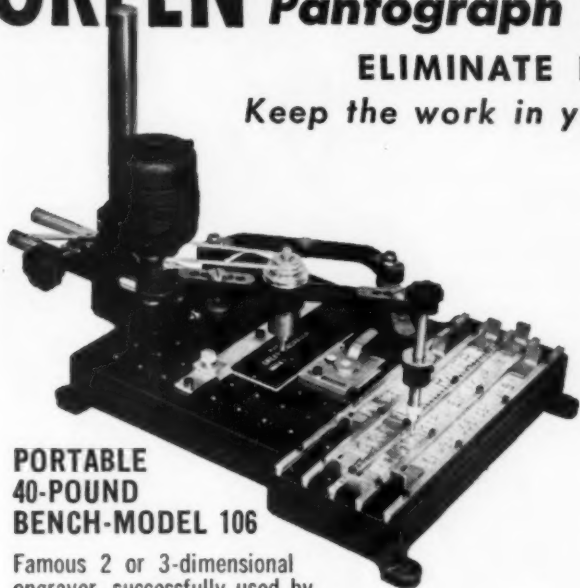
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**ELIMINATE DELAYS!**

*Keep the work in your own plant.*



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Famous 2 or 3-dimensional engraver, successfully used by thousands, features 5 positive, accurate pantograph ratios. Versatile ball bearing spindle has three speeds up to 14,000 rpm; height of pantograph and position of cutter are continuously adjustable; one copy carrier (supplied) accepts all standard master type sizes.

The Model 106 has proven incomparable for speed and accuracy . . . yet reasonably priced.

Cutter grinders, rotary tables, master letters, compound slides, name plates and all required accessories. For complete information, write to



## **MODEL D2 HEAVY-DUTY 2-DIMENSIONAL**

- 575 pounds — rigid, sturdy, precise
- Vertical adjustment of copy table automatic with Pantograph
- Unobstructed on three sides to take large work
- Micrometer adjustment for depth of cut
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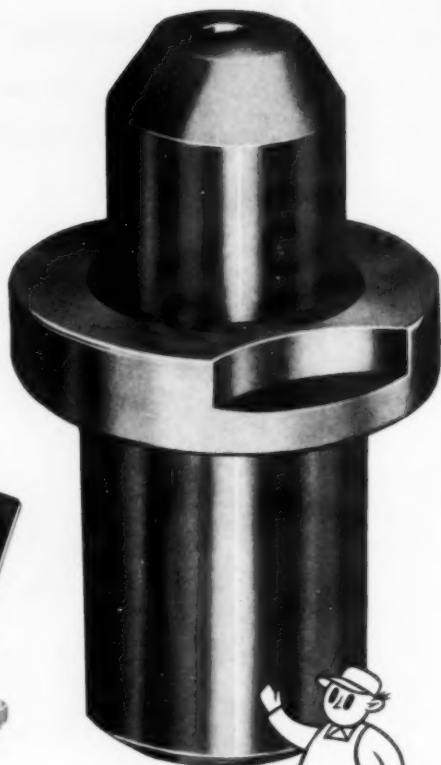
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COMPANY, INC.**

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Nation's best-selling chemical  
cutting fluid scores again!"

### SALES REPORT

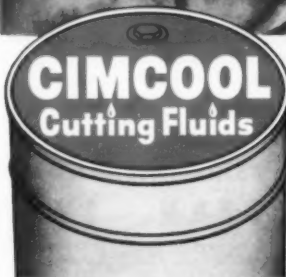
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and this company\* had been using a good grade soluble oil at 1:20 for machining steel. But rancidity was making them change the coolant every week. So they put in Cimcool at a 1:40 dilution. That was three weeks ago. And still not a sign of rancidity! CIMCOOL has saved them money, and kept production going. Their grinding room foreman also wants Cimcool because it has already increased cutting fluid life three times!

*Bad Hume*

Detroit Office

\* Name of this construction machinery manufacturer on request



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

**CIMPERIAL**—newest in the famous, industry-proven line of Cimcool® Cutting Fluids!  
**CIMCOOL 52 Concentrate**—The pink fluid which covers 85% of all metal cutting jobs.  
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The  
**Original**  
SAFETY BACK  
WHEEL  
DEVELOPED  
IN 1956



## MANHATTAN SAFETY BACK FLARED CUP

Not simply a new safety "feature" . . . not merely a design "improvement." Here's a *totally new concept* of flared cup wheel design and construction . . . developed by Manhattan engineers to give the greatest safety and performance advantages possible for flared cup wheel users. Manhattan's revolutionary SAFETY BACK Flared Cup puts portable wheel safety where it counts the most—in *original* strength and breakage resistance!

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### NO OTHER WHEEL—AT ANY PRICE— OFFERS THESE EXCLUSIVE FEATURES

- Greatest Initial Strength
- Easy Mounting—Easy Operation
- One Piece Assembly
- Highest Safety Factor
- Improved Mounting Base
- Requires No Adjustment

Only SAFETY BACK gives you these features—*plus* Manhattan's custom-engineered abrasive bond for faster removal of more metal on your particular job—at no additional cost! For "More Use per Dollar" in portable grinding operations, you can't get a faster cutting, longer lasting—*safer* wheel than MANHATTAN.

Let a Manhattan abrasive wheel engineer show you the advantages of SAFETY BACK Flared Cups, and other types of Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

RM 555



WRITE TO ABRASIVE WHEEL DEPARTMENT

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die sets

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like the amazing speed  
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made possible by  
Quick-Fit Guide Pins.  
(Safer handling, too.)

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performance justifies the  
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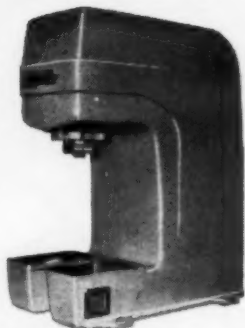
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so productive it...**

# **GUARANTEES YOUR SAVINGS**

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Multipress is ideal for assembly, forming, staking—and 101 other shop jobs. No cost or obligation to try it out now, in your own plant.



*Denison Model "A" hydraulic  
Multipress. Available in  
1-ton and 2-ton ram capacity.*

*You pay only for the freight*

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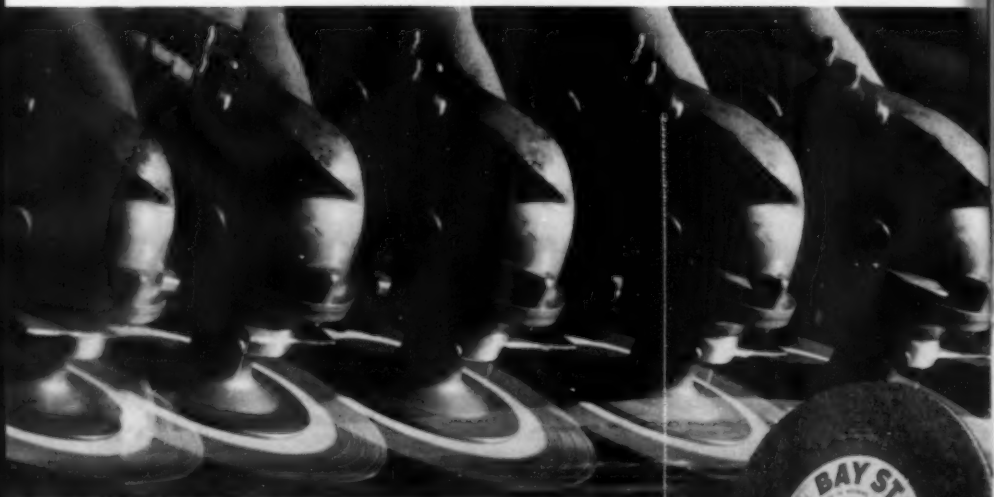
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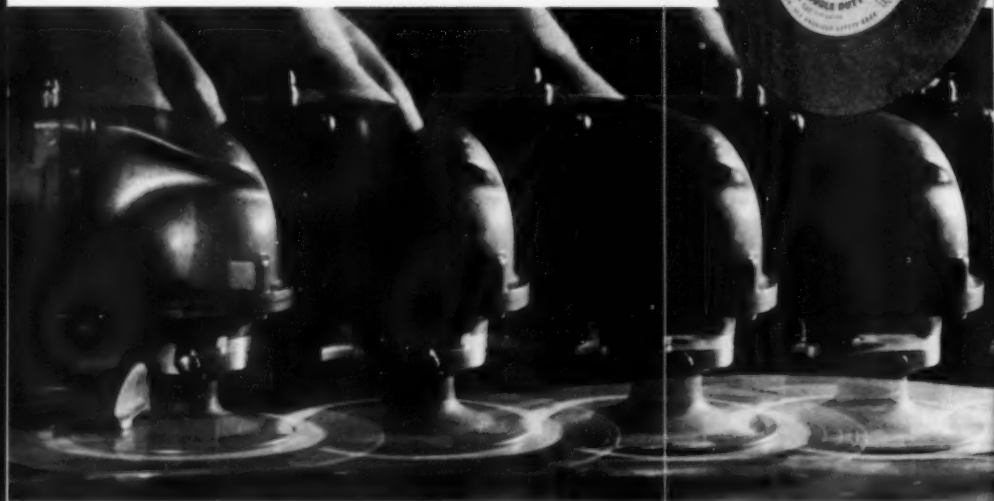


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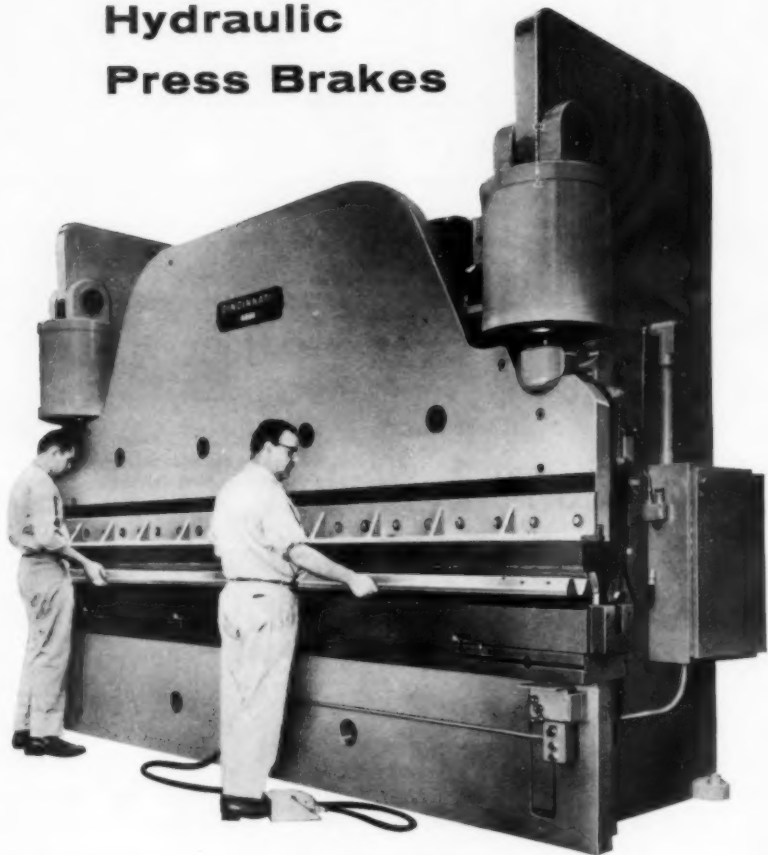
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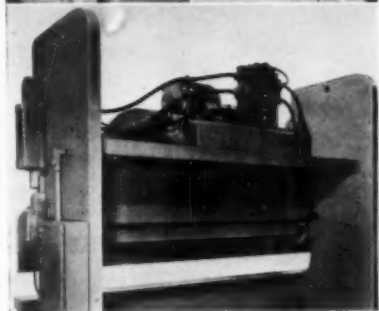
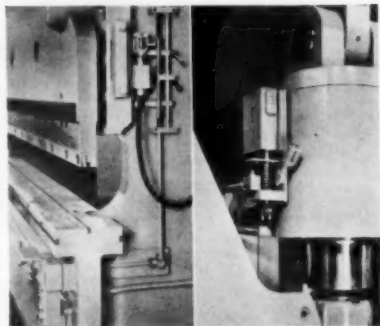
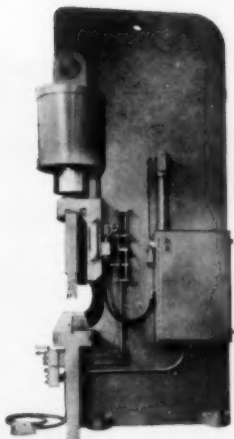
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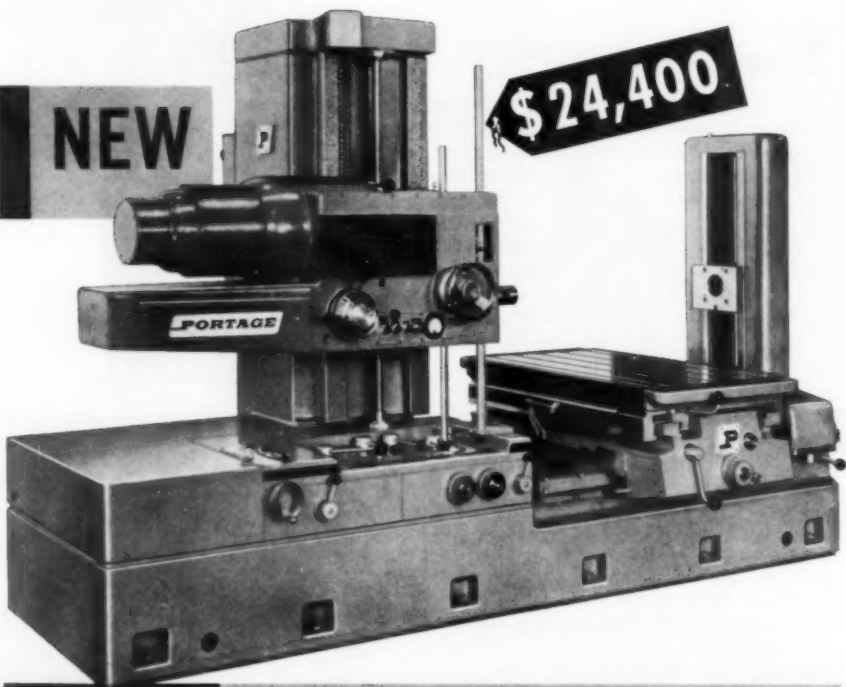
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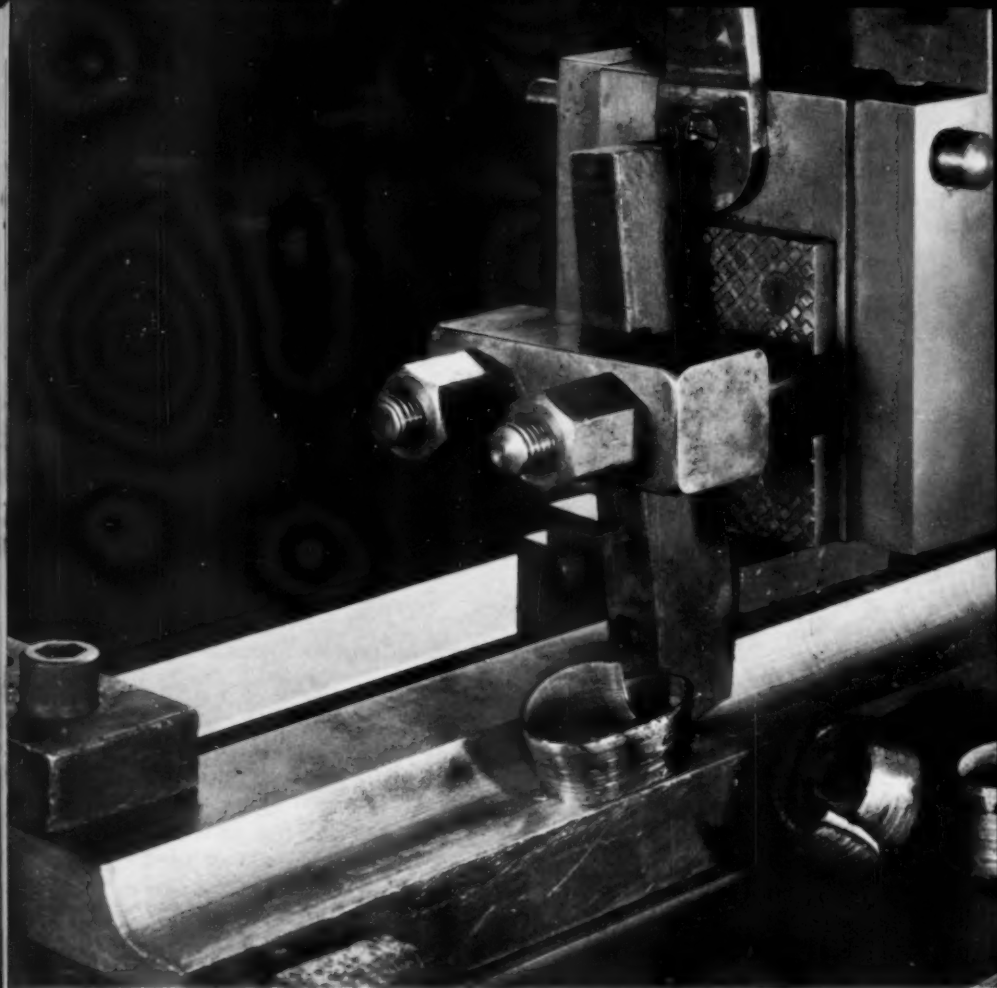
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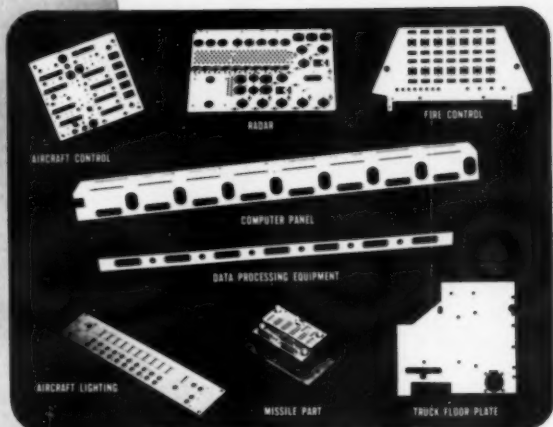
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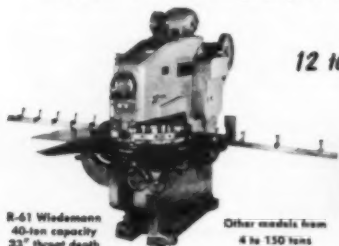


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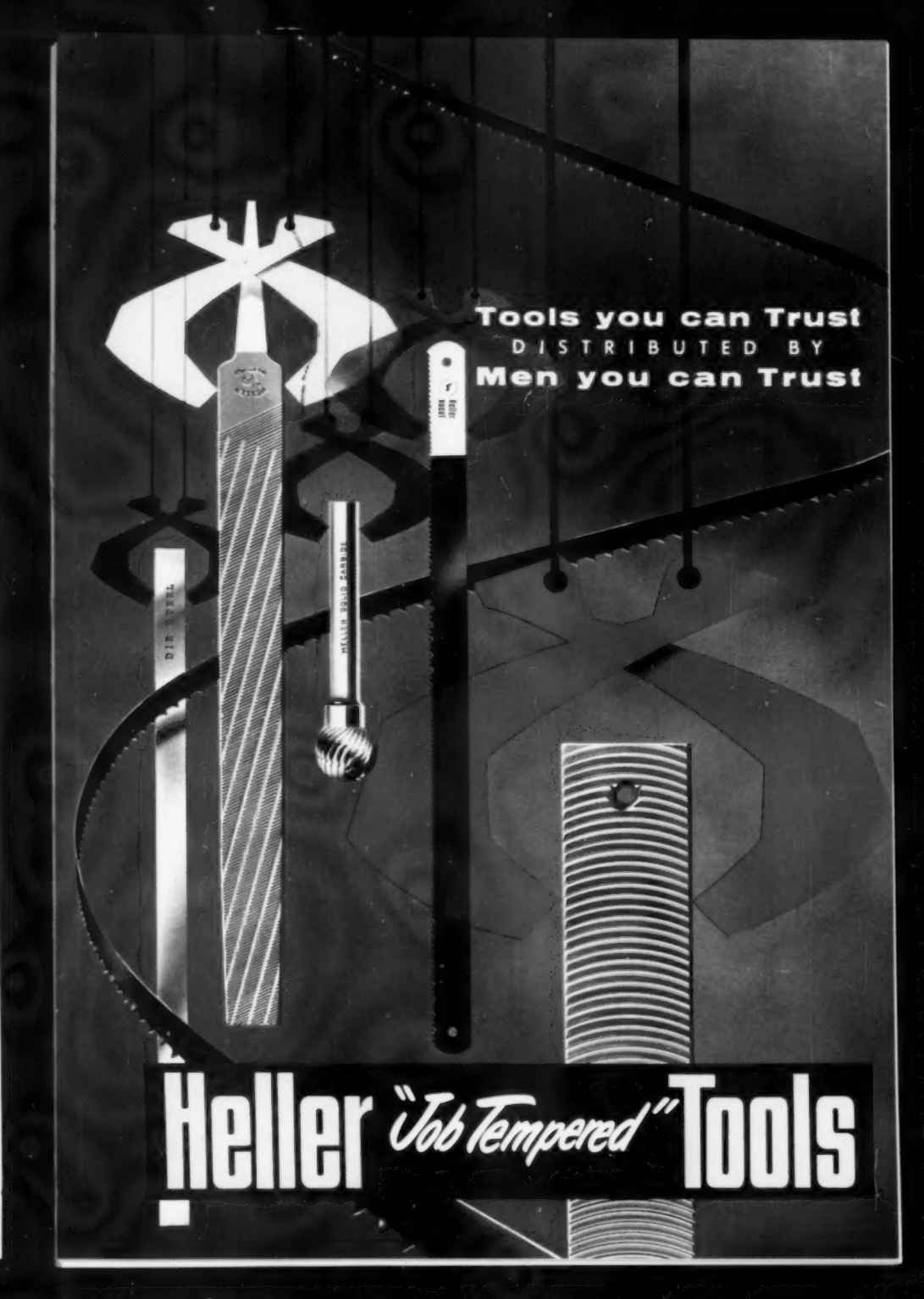


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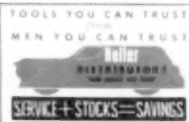
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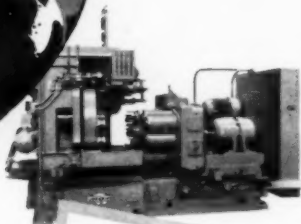
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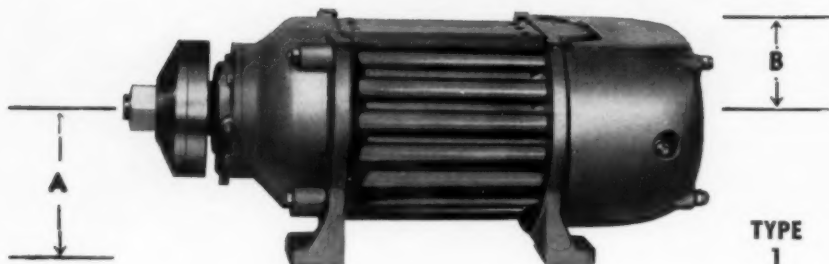


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1 - 20

5 - 30

20 - 60

FRAME  
SERIES

20

30

40

50

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4"

5 1/8"

7-1/16"

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## Features in This Issue



**Reducing Production Costs with Pneumatic Devices ..... 99**

**5 Answers to 5 Labor Grievances .....109**

**Scientific vs Add-on Turret Lathe Design .....129**

**Washington News.** The Research and Policy Committee of CED reports on the budget and economic growth; the GOP reconsiders its stand on sustaining tax rates; Congress overshoots the budget. ....**Page 91**

**Pneumatic Devices.** Inexpensive pneumatic operated devices can solve production bottlenecks and cut costs. H. L. Stewart's article tells you what factors to consider in designing air-operated jigs, fixtures and tools. He describes two typical applications concerned with valve liner production, featuring simple but effective piping layout. ....**Page 99**

**Practical Arbitration.** Harold R. Nissley carries on where he left off in Part V. Whereas that installment was concerned with the approach taken by a company president in disposing of 30 grievances, this article deals with five of the grievances and how Mr. Nissley answered them. In addition to describing the various problems, the author presents a thorough analysis and recommendation for each grievance. ....**Page 108**

**Abrasive Cut-off Wheels.** John A. Mueller continues his discussion of recommendations for using abrasive cut-off wheels most efficiently by disclosing more results of

tests conducted in Carborundum's laboratory. ....**Page 120**

**Scientific vs. Add-on Turret Lathe Design.** Throughout the years, the "add-on" process has been the history of turret lathe development. A fresh, scientific approach is beyond the talking stage and eventually should prove fruitful. The accompanying improvements in efficiency and performance promise to be significant. **Page 129**

**Tool Grinding.** Accuracy, repeatability, set-up and blending of the radius has always been a problem in the grinding of single point tool profiles. DeVlieg's new Micro-point tool grinder is designed to grind single point tools of carbide, H.S.S. and ceramic up to 1" square or round. Set-up is merely a matter of direct dial readings, assuring precise repeatability. ....**Page 137**

**Layout Machine.** Layout time has been cut 75% at the Ingersoll Milling Machine Company plant in Rockford, Ill. with the aid of two Portage layout machines. ....**Page 141**

**Drilling and boring accuracy.** For extremely high accuracy in heavy duty drilling and boring jobs, the American Tool Works Co., Cincinnati, offer their new tape-controlled positioning table. ....**Page 145**

### **Nissley on Incentives**

As per your invitation I would like to take this opportunity to comment and question Mr. Nissley through you on material pertaining to the second case presented in the April issue of the BLUE BOOK.

From Mr. Nissley's two eight-hour studies, he found that the company time study man was correct on his re-runs, down time, and 30 out of 45 elements which were borrowed or common elements. This left the only error of the study in the 15 elements which were new. It seems absurd to me to think that the 15 new elements were so far off that it may have affected the total rate by 12% since there was only about 10% difference in the effort rating given by the arbitrator as against what was given by the company time study man. Saving this another way, if the job was done the same way, they should have both clocked the same time and the only difference could be in their effort rating but this was within 10% of one another.

My question to Mr. Nissley is, could he enlighten us on where the trouble was? The facts given here indicate the trouble was within the 15 elements; yet, no mention was made of why the time taken was different when the arbitrator was timing as against when the time study was timing.

Raymond H. Tolman  
Manager, Industrial Engineering  
Bay State Abrasive Products Co.

### **Mr. Nissley's Reply**

There is more than one approach to a work standards or incentive dispute. An arbiter may take a careful look at the company time studies and either verify them or point out the errors in them. If and when certain important information is missing (and is refused him when he requests it) an arbiter must, or should, start from scratch and establish his own reference points. This latter was the situation in the arbitration case cited in the April issue of the BLUE BOOK to which you allude.

The company did not let me see any of their original time study sheets. The company time study men did not qualify their ratings during our joint observations by saying, for example, "we rated the 15 new elements 50% and the 30 old elements 100% in order to get our over-all average rating of 85% to 95%." All 45 of my elements were timed and rated at one time (over a two-day period) by the same observer (myself). Thirty of my elements checked perfectly with the 30 allowed times of the company (despite differences in our rating techniques). For these and other reasons which I will not go into I felt my over-all allowed time was not only within my own acceptable tolerance range but was within the Company's acceptable tolerance range.

Under these circumstances I can only guess as to the reason why I and the Company agreed so perfectly on the 30 old common elements and

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## Letters

continued

why we differed so radically on the new 15 elements. Your guess is as good as mine. Here are some of the possible reasons:

1. In its zeal to correct loose standards, did the Company "over-correct" in this instance by sharply reducing the allowed times on the 15 elements?
2. Did the Company use two different time study observers in arriving at its final time standard—one observer for the old 30 elements and another observer for the time values on the new 15 elements?
3. Could it be that the time values on the 30 old elements were based on multiple studies (or standard data) compared with

a few studies (or one study) on the 15 new elements?

4. If the 30 old elements were timed by one observer and the new 15 elements were timed by another observer, were these two observers of equal competence?

These are just a few of the questions that went through my mind when I discovered the close agreement between my time on the 30 old elements with the Company's allowed time on these same elements, and when I discovered the wide discrepancy between my allowed times on the 15 new elements and the Company's allowed time on the same 15 elements. I should say, however, that I had enough other checks on my own work without this 30 element

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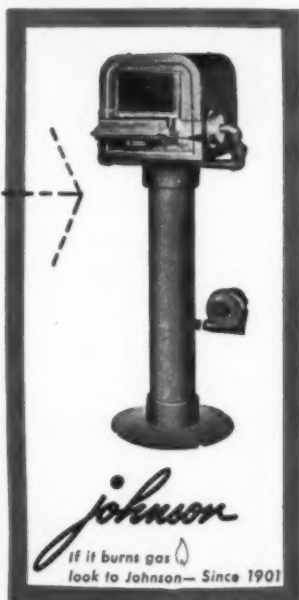


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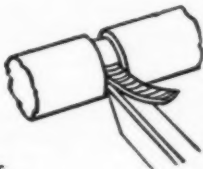
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## Letters

continued

bench mark check to satisfy me that I had superior data to any which the union or the company had supplied me with. Part of this confidence was based on my use of two watches (one used for snap-back readings and the other for over-all checks); the Company used a single watch for snap-back readings only.

After I had worked up my data I could have returned to this distant plant or I could have probed by letter or telephone the reasons for the wide discrepancies between my total time on the 15 new elements and the Company's total time. But such further inquiry has the effect of adding to the cost of an arbitration without changing the final results;

indeed, such additional probing may discredit and embarrass an industrial engineering department to the point where it becomes awkward for a Company to continue with its present industrial engineering staff. For this reason I have long advocated a periodic audit of an industrial engineering activity by competent registered consulting engineers who can not only minimize such embarrassment but who can frequently "sell" top management ideas which the local industrial engineers have been trying to sell for years.

HAROLD R. NISSLEY  
3514 Radcliffe Road  
Cleveland Heights 21, Ohio

## Meetings

Jun 14-19—Society of Automotive Engineers, Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, New Jersey. Headquarters: 485 Lexington Avenue, New York 17, New York.

Aug. 10-13—Society of Automotive Engineers, National West Coast Meeting, Hotel Georgia, Vancouver, B.C. Headquarters: 458 Lexington Avenue, New York 17, New York.

Sept. 10, 11—The Society of the Plastics Industry, Inc., Midwest Section Conference,

French Lick Sheraton Hotel, French Lick, Indiana. Headquarters: 250 Park Avenue, New York 17, New York.

Sept. 14-17—Society of Automotive Engineers, National Farm, Construction & Industrial Machinery Meeting, Production Forum, and Display, Milwaukee Auditorium, Milwaukee, Wisconsin. Headquarters: 485 Lexington Avenue, New York 17, New York.

Oct. 12-14—National Electronics Conference, Hotel Sherman, Chicago. Headquarters: 185 N. Wabash Ave., Chicago 1, Ill.



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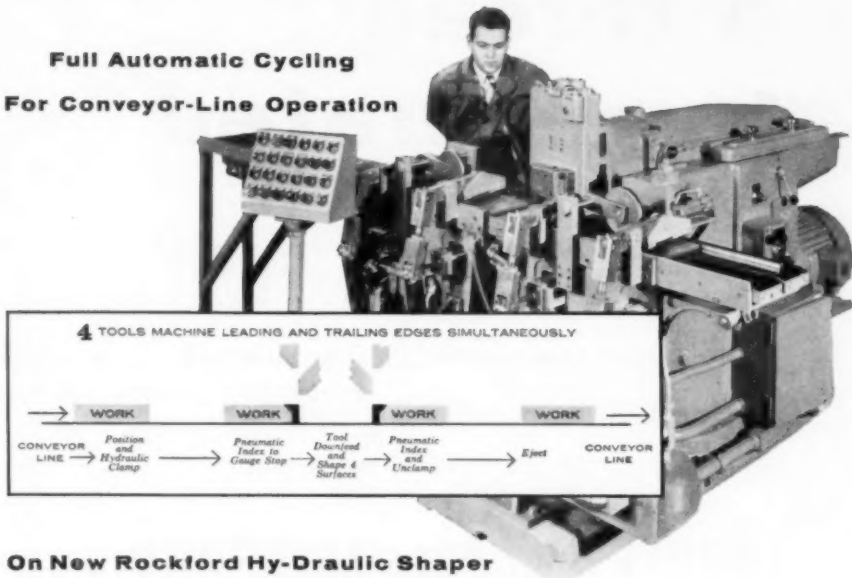
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### **On New Rockford Hy-Draulic Shaper**

Believed to be the first automatic shaper built, this standard 24" shaper with special tool head and cross-rail has been adapted to conveyor-line operation by arranging completely automatic cycling, including loading and unloading.

With this new method, many types of flat plates may be machined accurately and efficiently at high production rates, saving costly cutting tools and extra fixturing expense.

Four standard high speed steel tool bits with identical grinds are used to finish one vertical and one angular surface of each of 2 pieces simultaneously, as shown in diagrammatic sketch of the automatic cycle. The machine features pneumatic index, hydraulic positioning and clamping, and positive mechanical feed. Operation is continuous until machine is stopped by operator, or automatic safety devices reject the cycle sequence.

This type of automatic machining has many variations, using Rockford Hy-Draulic Shapers. If you have high output requirements for work which lends itself to this type of machining, send us blueprints for estimates and recommendations.



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every minute of each day—somewhere throughout the world, with a product of this plant—the world's largest, in terms of employment, product value, and completeness of line, devoted exclusively to the manufacture of thread generating equipment.

**LANDIS *Machine* COMPANY**  
WAYNESBORO • PENNSYLVANIA

549



## Roundup of Washington News



**U.S. strength is fully adequate** to meet big or little war threats today and in the near future. Soviet heavy and medium bombers—rather than long-range missiles—are the main current threat to the U.S. This country now has a very marked superiority in heavy bombers, and its medium bombers also have an edge, although a somewhat slimmer one. Within the next few years Russia may be able to produce more intercontinental missiles than the U.S., but it's not our intent or policy to match missile for missile Russia's capability.

**Defense Secretary McElroy**

### **GOP Reconsiders its Stand on Sustaining Tax Rates**

Reports brought back by Republican Senators and Representatives from Easter vacation trips to their home states have caused the Administration to take a second look at its "no tax relief now" policy. The returning Congressmen have told of a growing concern among the folks back home regarding the tax situation—aggravated in many cases by impending hikes in state levies.

The GOP is aware that its candidates will have a much better chance for election next year if the Administration recommends a tax cut at this second session of Congress. In addition to a general tax cut when it is feasible, the President actually favors an overhauling of the Internal Revenue Code. He is convinced that this is the only way to encourage business expansion.

If the Administration finally does come up with a tax reduction

proposal, it is likely to be a 5% general cutback plus some aid for business. Then the Democrats will probably retaliate with a more generous measure.

### **Congress Overshoots Budget**

In case you want to talk to your Members of Congress about economy in government, here is the picture:

The Senate at this writing has overshot the President's fiscal 1960 spending figures by \$2,527 million, and the House by \$314 million.

The excess spending approved by the Senate included \$1,925 million for housing, \$337 million for depressed areas and \$265 million for federal aid-to-airports. The House voted \$300 million for veterans' housing and \$97 million for aid-to-airports in excess of the budget figures, but made up part of this sum by trimming regular appropriation bills.

### Hitchcock President Appointed to BDSA



R. C. Van Kampen

Robert C. Van Kampen, president of Hitchcock Publishing Co., publisher of the MACHINE and TOOL BLUE BOOK, has been appointed

to the National Defense Executive Reserve, Business and Defense Services Administration. At a two-day conference in Washington May 12-13, BDSA reservists were briefed on current defense mobilization plans.

The Reserve extends into approximately 16 Federal agencies, and was authorized by Congress in 1955 to provide manpower for top management and technical positions following enemy attack.

### CED Reports on the Budget and Economic Growth

The Research and Policy Committee of the Committee for Economic Development has released a 44-page statement covering its

members' views on National Policy, and devoted to consideration of the issues raised by the President's \$77 billion 1960 budget.

The Committee is agreed that, assuming economic recovery continues, the cash budget for fiscal year 1960 should be brought into balance. Any increase in expenditures above the President's budget should be matched by additional taxes, they declare.

Another conclusion reached by the Committee in the consideration of these issues is that the Federal government should plan now for cash surpluses and debt reduction in subsequent years under conditions of high employment.

Regarding military expenditures, the Committee is of the opinion that any additional disbursement that would contribute significantly to our national security should be made, even at the cost of higher taxes. U.S. economic assistance to underdeveloped countries they consider an essential element of the nation's security effort, and should be enlarged beyond the program presented in the budget.

**If we do not control inflation,** we may lose the cold war by pricing ourselves out of world markets . . . Our friends abroad have politely hinted that any nation incapable of fiscal self-discipline is incapable of free world leadership.

**William A. McDonnell,** Retiring President  
U.S. Chamber of Commerce



# Questions and Answers about ELCIDE 75

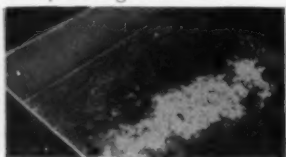
*Here's what you'll want to know about this new bacterial inhibitor for soluble oil emulsions:*

**Q: What is Elcide 75?**

**A:** Elcide 75 is a new bacterial inhibitor for standard duty soluble oil emulsions. Chemically, it is a combination of Sodium Ethylmercuri Thiosalicylate (Thimerosal) and Sodium *o*-phenylphenate in a concentrated solution.

**Q: What does Elcide 75 do?**

**A:** Elcide 75 controls bacteria that contaminate soluble oil emulsions. Since both chemical ingredients are anti-bacterial agents, Elcide 75's double action controls a far wider range of bacteria than the commonly used germicides.



Bacteria like these can spoil emulsions. Elcide 75 stops their damage.

**Q: Why is bacteria control important?**

**A:** Bacteria enter emulsions through the air, water, and plant debris. They multiply rapidly and cause odor, corrosion, and premature emulsion breakdown. This compounded damage costs millions of dollars each year in higher maintenance and production costs. Bacteria control reduces these expenses.

**Q: How does Elcide 75 lower costs?**

**A:** The use of Elcide 75 can increase emulsion life as much as 5½ times. You use less soluble oil. Fewer man-hours are spent servicing machines and disposing of waste

oil. And, because machines run longer between emulsion changes, production is increased proportionately.

**Q: What is the exact dollar return from Elcide 75?**

**A:** No exact figure can be established because conditions vary between plants. The type of metal, machines, and operations involved, the coolant, and general plant housekeeping are all factors that help determine savings due to Elcide 75. The best way to measure its value is to try Elcide 75 and compare the results with untreated machines in your plant.

**Q: How is Elcide 75 used?**

**A:** One ounce of Elcide 75 is added to each four gallons of emulsion. You know you have a safe, effective treatment because you control the dosage.

**Q: Is more data available on Elcide 75?**

**A:** Yes. Complete information on compatibility, disposal, stability, safety, and other pertinent factors is immediately available on written request.

**Q: Where can I buy Elcide 75?**

**A:** Elcide 75 is sold only through selected distributors. To place your order, or for the name of your nearest distributor, write Eli Lilly and Company, Agricultural and Industrial Products Division, Indianapolis 6, Indiana; or call MEIrose 6-2211.

*(Lilly's brand of bacterial inhibitor for cutting fluids)*

Package	Price per Gal.
1-gal. (4 per case), polyethylene.....	\$8.50
5-gallon, polyethylene.	\$8.00
55-gallon, stainless steel.	\$6.50



**ELCIDE 75**<sup>TM</sup>  
PATENT PENDING

KEEPS COOLANTS FRESH AS A DAISY!

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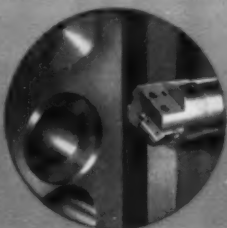
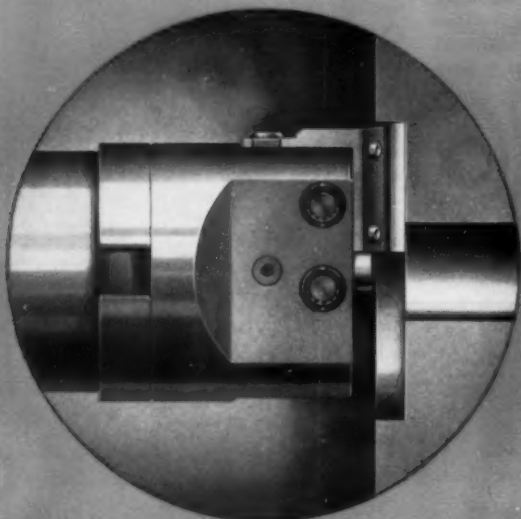
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NEW FROM FAIR STREET • HOME OF MICROBORE

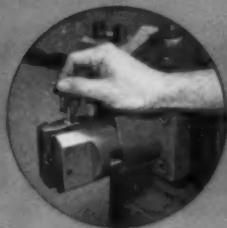
# microface<sup>®</sup>

## ADJUSTABLE BLADE FACING HEAD

(Patent Pending)



Adapters accommodate 5 standard microface head sizes for all machines.



Quickly installed and adjusted to .001" on dia. while on the machine.

For boring machines, turret lathes and heavy drilling equipment, this new addition to the Microbore Tooling System bores, faces or spot faces wide surfaces from 1½" to 8½" dia. without special tooling. Often eliminates the necessity of generating faces by slow cross feed methods. Dovetail blade holder mounting in the rugged, one-piece head eliminates chatter, assures consistent accuracy, fine surface finish and prolongs blade life. Adjustment of interchangeable high-speed steel or carbide blades is fast and accurate. *Blades replaceable with a minimum of down time without removing head from the machine.*

Write for technical 4-page brochure.



# DEV LIEG MICROBORE<sup>®</sup> SYSTEM

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• DIVISION OF DEV LIEG MACHINE COMPANY

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### Replacement: Haphazard or Scientific?

Too many factors are involved to enable the various segments of industry to be in complete accord regarding the economical life of machine tools.

In some industries the need for keeping abreast of new developments is so acute that survival depends on it. Other industries can slide into obsolescence because any lessening of plant efficiency is more gradual. In the former case, the constant search for a way to reduce processing time requires a periodic study of the operating history of each machine. Such an assessment reveals the economics inherent in the new or improved models. In those plants where the drift into obsolescence does not affect production costs to the same extent, a definite replacement policy is highly important. The danger here is that the whole shop can fall to the point where the only solution to regaining economic production is a very heavy investment in new equipment.

During the past few weeks we have seen the unveiling of several new machine tools that demonstrate some original engineering thinking. Builders are even departing from convention to take advantage of design improvements when a different material suggests possibilities. One example is an engine lathe with all steel welded

construction. (See page 149). Every month brings one or more entries in the numerical control sweepstakes: drilling machines, boring machines, turret lathes, positioning tables, etc.

These improvements make it harder for conscientious management to seek excuses for retaining some of their machines in service. The scientific approach to a decision on whether or not a new machine tool is warranted is to study the operating history of every machine. With a statement of maintenance cost over a period of time, you assess such factors as an estimate of the quality improvement resulting from a new machine, along with reduced set-up time, reduced cost of running and maintenance.

A 10-year old machine is 10 years old in design and thinking. The past two years alone have uncovered innovations that equal what came off the drawing boards during the previous eight years.

Management cannot afford to be apathetic about the new machine tools appearing on the market. On the modernity of machines and methods rests industry's hope of combating rising labor costs and promoting higher quality standards.

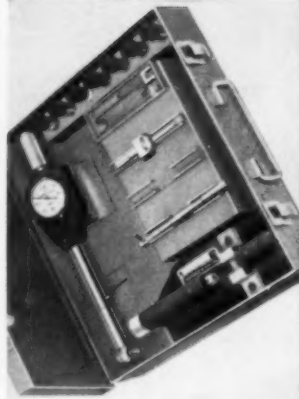
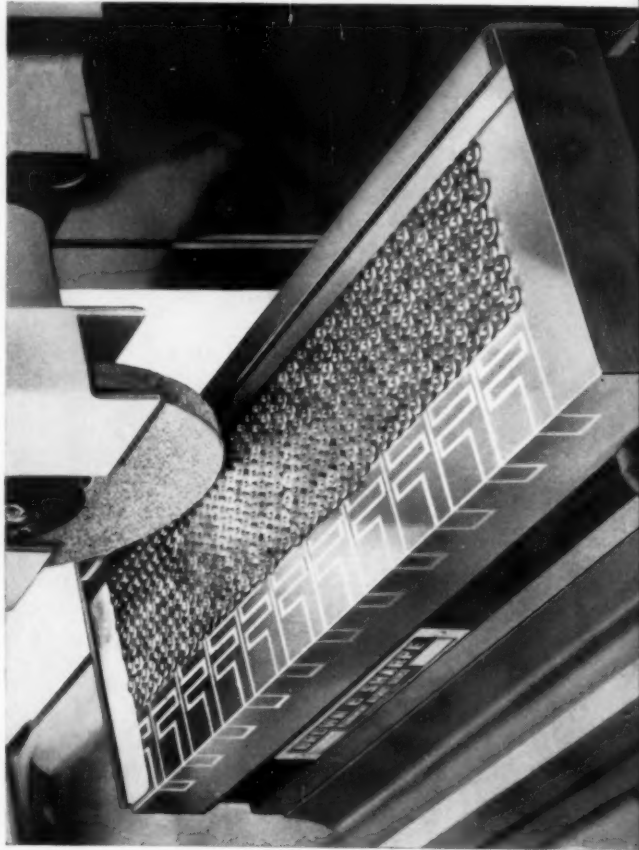
PAUL A. MELINE  
*Managing Editor*

# Precision Tool News

**B.S.**

No. 10

REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER



## **New B & S Dial Bore Gage Set Saves Up to 50% Cost Covering 1/8" - 1" Range**

Interchangeable arbors and measuring heads are used with one basic indicator assembly in the new Brown & Sharpe economy Dial Bore Gage Set. It covers measurements from 1/8" to 1", by .0001" — yet sells for only about \$400 — half the cost of separate gages for this range. A bore-gage setting device that eliminates the need for setting rings is included.

very small parts or thin strips

## held tightly and accurately on new B&S Fine Mesh Permanent Magnet Chuck

Magnetic poles are closer together on this new Brown & Sharpe chuck than on any other permanent magnet chuck. Closest spacing in the pattern is  $\frac{3}{16}$ " and at no place within the magnetic area are poles more than  $\frac{3}{16}$ " apart. As a result you can hold smaller parts — anywhere inside the area — without worrying about weak spots.

The extra-fine mesh also holds long, thin strips perfectly flat — without the waves that are apt to develop in strips when they're held on chucks with wider pole spacing.

You get exceptional accuracy with this chuck, because of its extra-thick, rigid top plate — that doesn't deflect or sag when the chuck is turned on.

And, the thick top plate lasts longer, too — it can be dressed down a full  $\frac{1}{2}$ ". Brown & Sharpe's Fine Mesh Rectangular Permanent Magnet Chuck, No. 618-3, provides a working surface of 6" x 18"; magnetic surface for small, thin parts of  $4\frac{1}{16}$ " x  $16\frac{1}{4}$ ". For larger, thicker pieces, its magnetic surface is a full 6" x  $16\frac{1}{4}$ ".



# Brown & Sharpe

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SCREW MACHINE TOOLS  
SHOP ACCESSORIES



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## Oblique Graduations on New B&S Micrometer Prevent .025" Errors

Patented oblique (slanting) graduations on the barrel of Brown & Sharpe's Con-vertible Thimble Micrometer show quickly "where you've been and where you're going." They are still visible when older style straight graduations are hidden. They prevent the unfortunate .025", one-revolution errors that so often occur.

**Other features:** Thimble converts quickly to either friction or fixed type — floating, thumb-operated lever clamp. Personalized with initials at no extra cost. No. 1011 — Range, 0" to 1", in .0001". Ask your B&S industrial distributor to show how these new tools can save money or time in your own operation. Brown & Sharpe Mfg. Co., Providence 1, R. I.



# Buyer's guide to RYERSON TOOL STEEL

**V.D.<sup>®</sup> TOOL STEEL**—an all-purpose, water-hardening carbon vanadium steel. Easy to machine . . . hard and tough after heat treatment. Hardening characteristics permit wide variation in treatment with uniformly good results.

**RY-ALLOY<sup>®</sup> TOOL STEEL**—an oil-hardening steel. Combines high hardness and deep hardness penetration with minimum distortion, freedom from cracking and good machinability.

**RY-ALLOY GROUND FLAT STOCK**—accurately ground on all four sides. Ends and sides are square, parallel, and accurate to dimension. Free of surface decarburization . . . spheroidize-annealed for best machinability.

**RY-ALLOY DRILL ROD**—non-deforming . . . excellent finish, accurately sized, free from decarburization.

**V.D. CHISEL STEEL**—a specially developed, water-hardening carbon molybdenum tool steel ideal for hand and pneumatic chisels.

**NON-TEMPERING STEEL**—good shock-resistant steel with strong wear-resistant characteristics when hardened. Designed for applications where tempering is impractical.

**CARBON STEEL DRILL ROD**—a high-grade drill rod with smooth finish and extreme size accuracy.

**TOOL STEEL SHEETS**—rolled from high-grade tool steel of about 1.00% carbon. Smooth, blue finish protected by oil. Can be hardened in oil or water; quenching medium depends on hardness desired.

**Speed production . . . save time and money with Ryerson Tool Steels. Whatever your needs, contact your Ryerson representative for widest selection, highest quality, fastest shipment, complete satisfaction.**

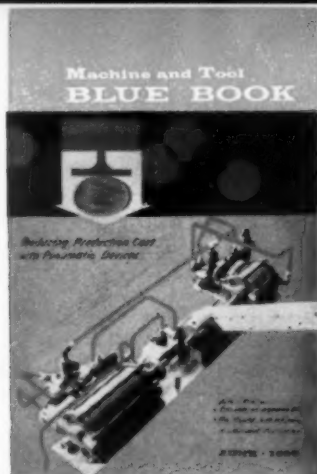


## RYERSON STEEL<sup>®</sup>

Member of the  Steel Family

STEEL . . . ALUMINUM . . . PLASTICS . . . METALWORKING MACHINERY  
NATION'S MOST COMPLETE SERVICE CENTERS IN PRINCIPAL CITIES COAST TO COAST

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## Reducing Production Cost with Pneumatic Devices

Here's how to do it with simple, inexpensive systems

By **H. L. Stewart**

● By looking around almost any production plant one can usually find many applications for inexpensive pneumatic operated devices that will save considerable production time. A little ingenuity on the part of the plant operating personnel can solve many production bottlenecks and reduce production costs. There is no need for fancy designs on fixtures, jigs, or tools that are used on relatively short production runs. In many plants, a 3-day run of several thousand pieces will meet production needs for several months. Unless the tool can be inexpensively made, a plant cannot afford to have such

tools sitting for any length of time not producing. An angle iron frame work or an "I" beam bedplate, as long as it is sturdily constructed, will amply serve as the basis for the tool.

### Factors to Consider

In designing pneumatically operated jigs, fixtures and tools, here are seven important factors for the tool designer to consider:

1. **KEEP THE PNEUMATIC SYSTEM AS SIMPLE AS POSSIBLE.** Do not overload it with unnecessary valving or other gadgets. Use a piping layout that will allow ample flow and give an appearance of neatness.



## *Why a pneumatic device? Competition dictates that tool*

2. ALWAYS USE A FILTER AND LUBRICATOR TO SERVE EACH CIRCUIT OR DEVICE. This costs a little extra on the original installation, but it will certainly pay big dividends in reducing maintenance and downtime due to wear and malfunction of components. Dirt is the major cause of component failure. Lack of lubrication quickly reduces the efficiency and life of the system.

3. MAKE THE PNEUMATIC SYSTEM AS SAFE AS POSSIBLE. Pneumatic devices react very rapidly. If there is any possibility of an operator getting his hand under a fast moving ram, use safety devices that must be actuated and held in place by both hands. The designer must remember that just any two-hand system will not be sufficient. The operator must not be able to tie down either control, nor can they be located so that the operator can knee one control or place a bar across both controls. The operator, in order to speed up his work rate, will try all kinds of methods even though he may endanger himself. Plant operating groups demand that circuits should protect not only the operator, but also the machine and the workpiece.

4. WHEN USING SOLENOID VALVES DESIGN THE CIRCUIT SO THAT SOLENOIDS WILL NOT BE ENERGIZED FOR

LONG PERIODS OF TIME. Even though continuous duty solenoids are used, it is not recommended that they be energized indefinitely.

5. USE STANDARD COMPONENTS WHEREVER POSSIBLE. This not only reduces the original cost but it also reduces replacement part costs. Special parts are often difficult to obtain. For instance, a valve built with a special packing to meet some designer's whim may cost three times as much as a standard valve. Then when it comes time to replace the packing, it is likely that the valve manufacturer will not have it in stock because he had bought only enough for the special order.

6. IF POSSIBLE USE CYLINDERS WITH BUILT-IN CUSHIONS. This greatly reduces shock and maintenance. The additional cost will be offset by reduction in maintenance.

7. DESIGN SUITABLE MOUNTING BRACKETS OR SUPPORTS FOR THE CYLINDERS. If a cylinder must move through an arc use flexible hose between the valve and the cylinder. Be certain that there is no misalignment between the piston rod of the cylinder and the piece which it is moving. Amply support the end of the rod on applications requiring long strokes.

*designers and production men reduce costs wherever possible*

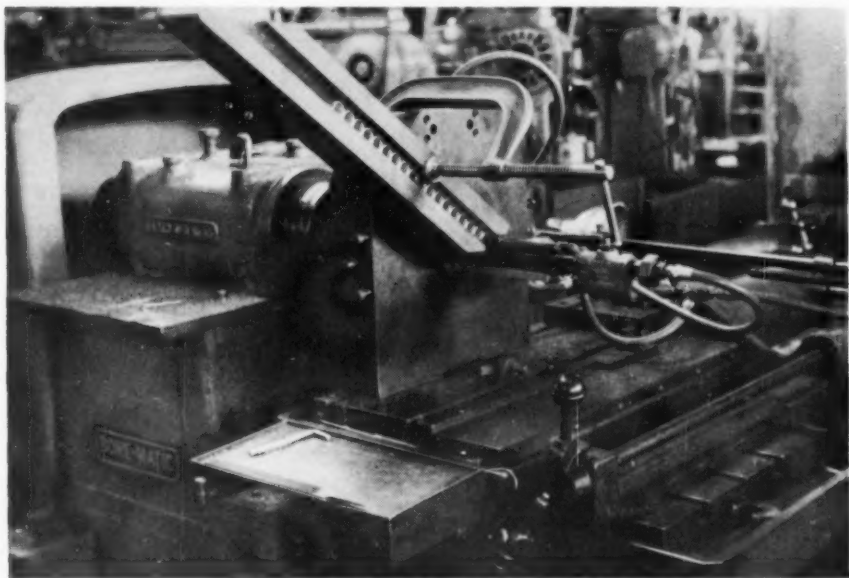
### **Examples of Low Cost Pneumatic Devices**

An example of an inexpensive pneumatic device is a fixture to automatically load valve liners into a clamping device.

The machine onto which the pneumatic fixture is attached is a Heald Borematic. These liners are just one of many items which must be processed on this machine so the fixture must be easily attached and removed. The boring machine is equipped with a head

that is stationary and a table that is traversed by hydraulic means. The table can be set for rapid advance, feed and rapid return. The tool is a single point boring tool which will finish the bore to within .0001 in. and provide a 10 micro-inch finish. Note the very inexpensive hopper for holding the valve liners, as shown in Fig. 1. It is made of wood and plastic and is clamped onto the plate by a large C clamp.

Fig. 2 depicts the positioning



**1.** Simple wood and plastic hopper for feeding valve liners. Large C clamp holds hopper on to plate. Machine is Borematic.

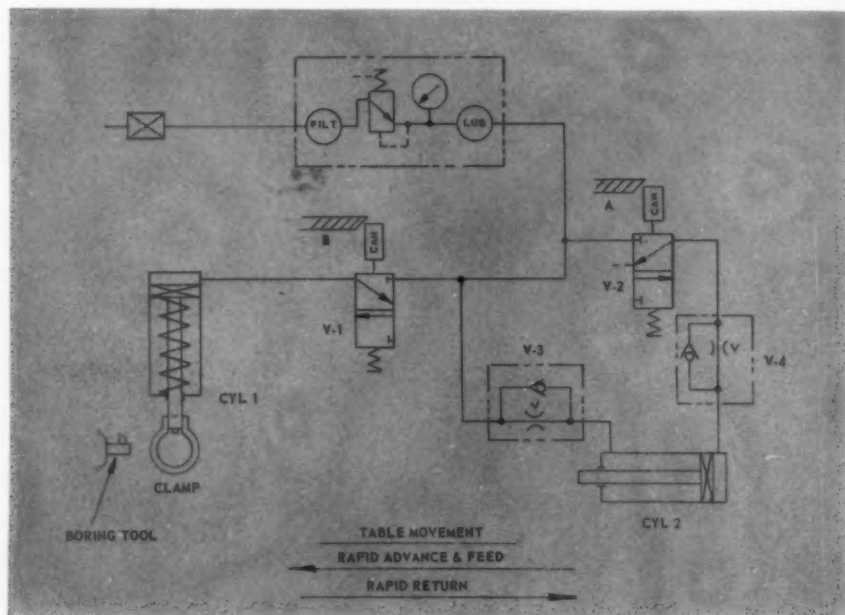
***Production time on boring valve liners was cut 65%***

cylinder, the flow controls, the directional controls and the operating cams. The directional controls are on the table. Fig. 3 shows the small clamping cylinder. Note how inexpensively it is mounted yet it has the stability for providing ample clamping force. The wooden box catches the liners as they are ejected by the positioning cylinder. Also note that the boring tool has entered the workpiece.

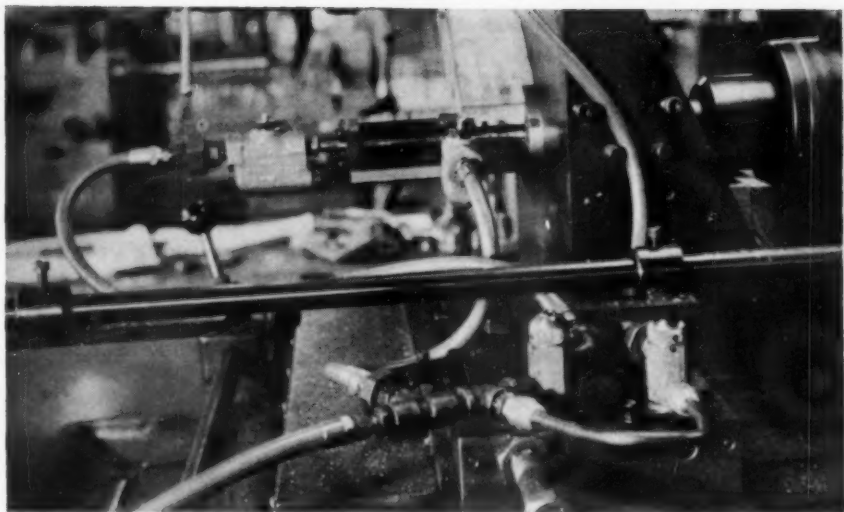
To understand the operation of the fixture look at the drawing of

Circuit No. 1. In this, air pressure is always on the rod end of cylinder No. 2. This provides rapid movements of the piston on the return stroke as soon as air is released from the blind end of the cylinder, and eliminates time lag which is present in conventional four-way valving.

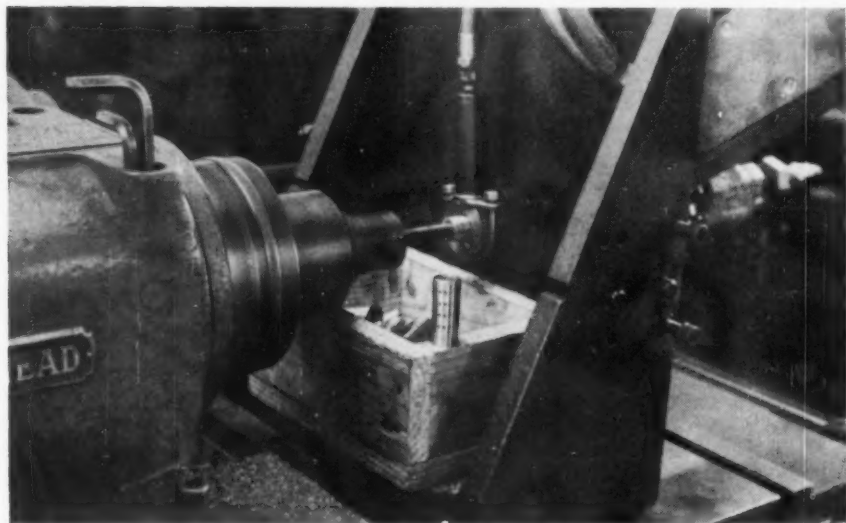
As the table moves on the rapid advance portion of the cycle, the stationary cam, fastened to the head section, depresses the plunger on three-way valve V-2; this allows



**CIRCUIT NO. 1**



**2.** Set-up on Heald Borematic showing positioning cylinder, flow controls, directional controls and operating cams.



**3.** Boring tool is machining valve liner. Note small clamping cylinder. This inexpensive device provides ample clamping.

***Ball burnishing operation rate formerly was 167 pcs/hr. With***

air pressure to flow through the free flow section of flow control valve V-4 and on to blind end of positioning cylinder No. 2. The difference in force between the blind end side and the rod end side of the piston causes the piston to move forward at a speed set by flow control valve V-3. As the piston moves forward the piston rod moves a liner out of the positioning chamber, ejecting the liner in the clamp and places the liner to be machined in clamping position. A small jet of air supplied through a hole drilled the length of the piston rod cylinder No. 2, blows the chips from the liner as it is being machined. Just before the table goes into the feed cycle cam B is contacted by three way valve V-1 and air is directed to the blind end of the single acting spring return, clamping cylinder No. 1. The liner is securely clamped and the boring tool contacts the liner just after the feed cycle begins.

At the end of the feed cycle, the table automatically reverses. Plunger of valve V-1 rides off cam B and inlet of valve V-1 is blocked. Air pressure which is holding cylinder 1 in clamping position is released and the piston of the clamp cylinder returns to original position, releasing liner. As the plunger of valve V-2 rides off, cam A inlet to V-2 is blocked and air exhausts

from the blind end of cylinder No. 2 through V-4 at a controlled rate and the piston of cylinder 2 is retracted. This allows another liner to drop into the positioning chamber thus completing a cycle. The table of the Borematic cycles continuously and on every complete cycle a finished liner is produced. With automatic cycling one operator can tend two or more machines. His only problem is to keep the hoppers filled and make provisions to remove the boxes of finished parts.

By adding this air operated fixture to the Borematic the time to produce 100 bored liners was cut from 2.85 hours to .91 hours.

**Ball Burnishing Operation**

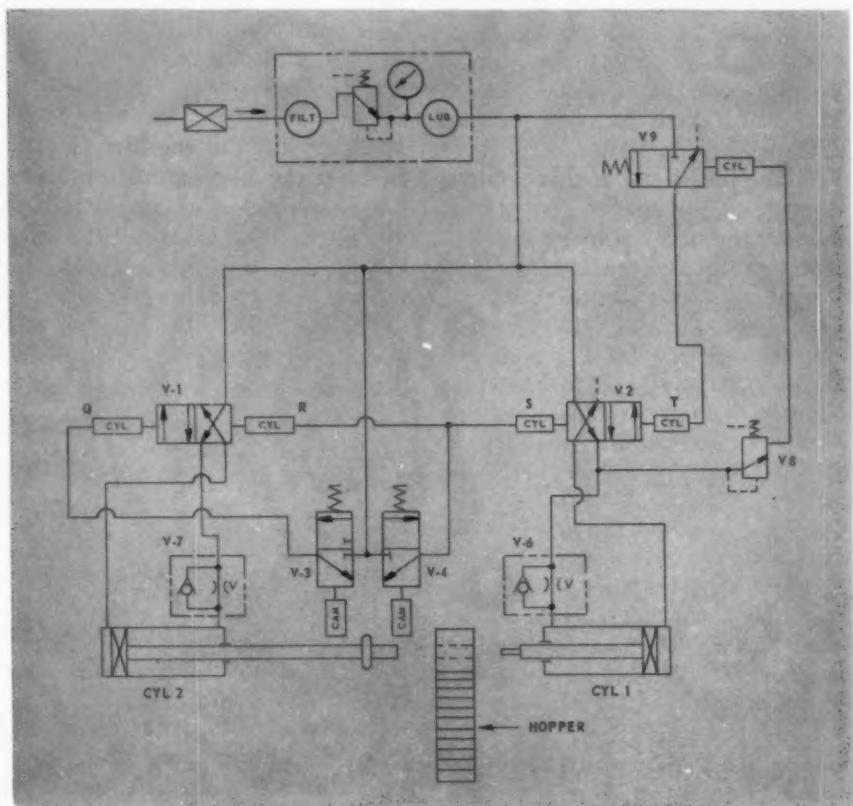
To insure a proper finish and size in the bore of valve liners it has been found that a ball burnishing operation seems to do the best job. The ball must be to size. In Fig. 4 note that the cylinders and liner holder are mounted on an H beam which has been ground on the mounting surface. This provides a true mounting base for the components of the machine. The hopper is made of wood and plastic and is mounted on the liner holder. To facilitate piping, tubing was used. This small machine may be easily moved around the shop. By changing the liner holder

*hopper and pneumatic hook-up, production rate is 1,600/hr.*

and push rods various sized liners may be processed on this machine. It is very versatile. Fig. 5 shows at left a close up view of the push rod, and the cam which trips the valves to provide automatic cycling. In making the setup for any size liner the burnishing ball is

forced into the end of the liner and the liner is placed in the left end of the liner holder.

To follow the operation of the circuit see the drawing of Circuit No. 2. Shut-off valve V-10 is opened allowing air to flow through the filter, lubricating, and regulating



**CIRCUIT NO. 2**

unit. Clean, lubricated air then flows to valves V-1, V-2, V-3, V-4 and V-9. Piston of No. 2 cylinder rapidly returns to the retracted position but does not bang against the cover as it is equipped with a cushion.

As the piston reaches the retracted position, the plunger of three-way valve V-3 is contacted by the cam on the end of the piston rod, causing the spool in valve No. 1 to shift; this directs air to the blind end of cylinder No. 2. The piston starts to move forward at a speed set by flow control valve V-7. The piston rod of this cylinder is carrying the pusher that moves the ball through the liner. The ball is moved through the first liner and a short distance into the second liner when the cam on the end of the piston rod contacts the plunger on three way valve V-4. When the plunger is depressed air pressure is directed to pilot connection R of four way valve V-1 and pilot connection S of four way valve V-2. Air pressure is directed to the rod end of cylinder No. 1, since piston of cylinder No. 1 is normally in extended position, and the piston rapidly retracts, allowing another liner to fall into liner holder. Piston of cylinder No. 2 also retracts but it takes a longer period due to the longer stroke. When the piston of cylinder No. 1 is completely retracted pressure builds

up to open sequence valve V-8; then air pressure flows to the pilot connection of three-way valve V-9. Air pressure then flows through V-9 and onto pilot connection T of valve V-2 shifting spool and air pressure flows to the blind end of cylinder No. 1 and piston advances at a speed controlled by flow control valve V-6 ejecting the bur-nished liner and moving the next liner into position. As soon as the piston of cylinder No. 2 is retracted, V-3 is contacted and the cycle continues. The only thing necessary for the operator to do is to keep the hopper full of liners. The liners roll off the machine into a padded bin. Valves V-1 and V-2 can be positioned manually during the setup period.

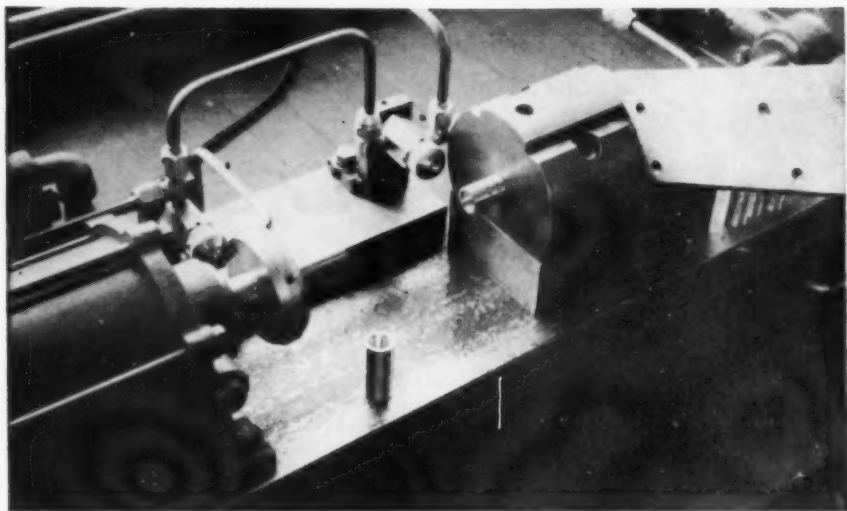
The production rate of this method is 1,600 pieces per hour. With the former method, which was to manually place the ball in the end of the liner and push it through the liner with a small hydraulic ram, the production rate was 167 pieces per hour.

Another application of pneumatics to the processing of valve liners is their insertion into valve bodies. The big savings here was a 90 percent reduction in rejects.

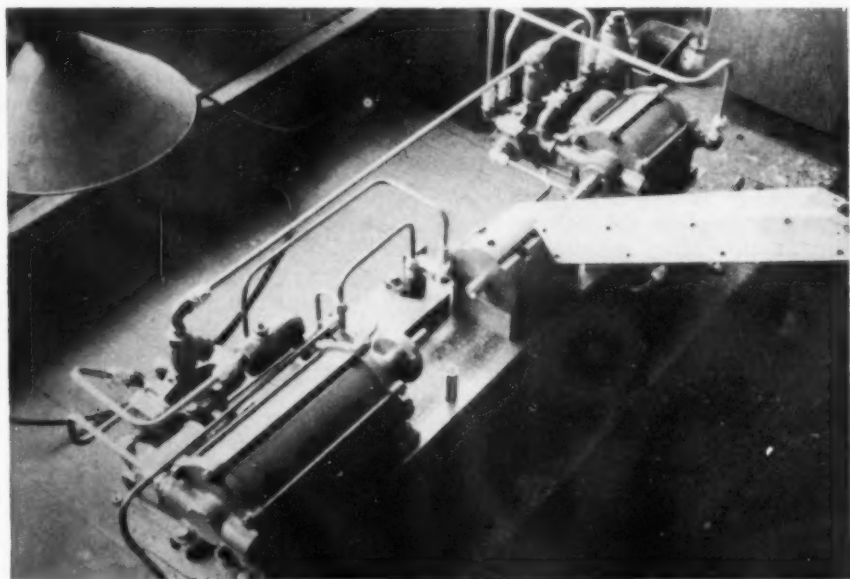
A look around the shop will disclose a number of applications for inexpensive pneumatically operated fixtures.

• • •





4. On ball burnishing operation the cylinders and liner holder are mounted on an H beam ground on mounting surface.



5. Close-up view shows hopper, push rod and the cam which trips the valves to provide automatic cycling of operation.

## 5 Answers to 5 Labor

1. *Objection to a transfer to a decadent department*
2. *Piece rate challenge on new but similar job*
3. *Overtime denied senior man*
4. *Failure to give sufficient layoff notice*
5. *Junior man retained; senior man is laid off*

● In an earlier issue of the *Machine and Tool Blue Book* the writer told "how a company president wiped clean a slate of 30 old grievances without arbitration before the Company went into its new contract negotiations. In that issue the writer described the unusual and skillful approach of this company president

in disposing of these 30 grievances: in that issue the writer stressed the technique of handling a docket of 30 grievances, many of them over a year old. *This* article will deal with a few of the more common grievances and the writer's answers to these grievances.<sup>1</sup>

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<sup>1</sup>Because of the many personalities involved in this series of grievances the writer must change the names of machines and operations so that the people involved in the original situations will not, readily, jump at hasty conclusions. But in changing the names of machines and jobs and the number of operators involved in a particular grievance, the core of the original "beef" remains unchanged. Indeed, any reader dealing with a militant or a vigorous union will detect a close similarity between some of the grievances related herein and grievances which the reader comes upon in his own factory.

# Grievances



By **Harold R. Nissley, P.E.**  
Consulting Engineer

## **1. Objection to a Transfer to a Decadent Department**

*"The Union protests the transfer of Joe Hill to Department G because this is tantamount to dismissal."*

UNION: "Our contract provides for departmental seniority—not plant-wide seniority. The contract also provides for the Company's freedom of choice in moving people around from one job to another after a 24-hour posting notice that permits senior men to bid on new jobs before the Company exercises its option of moving men onto other jobs.

"Joe Hill came to work with this Company four years ago as a Class C Machinist (now paying \$2.30 an hour). About a month ago Joe went on a 3-day binge and did not even call in. This caused some unhappiness; so when Joe came back to work his boss told him to report to

the Personnel Department. The Personnel Director told Joe the Company had to put another man on his job because it was a rush job; the other man was in the middle of this rush job when Joe returned; so the Company offered Joe a job in another department (at the same pay but different work). Joe accepted this transfer thinking he was going to an easier job. But when Joe showed up in this other department, he learned that a government contract had been cancelled during his absence and as a result the whole department would be shut down in another few weeks—and Joe would be unable to bump out of this department.

"We told Joe he should have come to us before he accepted this other job. But Joe thinks he is smarter than his union officers.

Whenever our people try to do business with this Company, it's like a man appearing in court without a lawyer—he doesn't stand a chance.

"According to the contract the maximum penalty the Company could impose on Joe for his absence is a written disciplinary notice. Here is what the contract says on unexcused absences: "First unex-

cused absence during a 12 month period, a written warning shall be given; second unexcused absence during the same 12 month period, 5-day layoff; third unexcused absence, discharge." The Company's action in transferring Joe to Department G after his first unexcused absence in over a year was tantamount to discharge. Obviously, if the Company had told Joe, when they lured him into the discharge trap, that he was headed for the bricks, then we would not be grieving about his synthetic discharge.

"Because this is Joe's first unexcused absence in nearly two years, we feel that his discharge was excessive punishment. We, therefore, demand that Joe be put back on his old job immediately or before Department G folds up. The man now holding Joe's old job is a 2-year man compared with Joe's four years of service with the Company."<sup>2</sup>



<sup>2</sup>The writer substantiated most of the Union's story when he confronted the Company Personnel Director with it. The Personnel Director said he did not tell Joe about the government contract cancellation at the time he offered Hill the new job because: "The function of a personnel director is to *sell* job openings—not to unsell them. Moreover, Joe Hill is a mature man capable of asking any questions he wished to ask about any new job: if he had asked about the job tenure on the new job we would have given him our latest pessimistic story on it. Finally, each day a man is absent from work without an allowable excuse is an unexcused absence. Joe was absent three days; he, therefore, had three unexcused absences. And the contract says that three unexcused absences within a 12 month period gives the Company the right to discharge a man."

## Analysis and Recommendations, Grievance No. 1

If the Company felt it had a good case for discharging Joe after his 3 day binge, it should have fired him upon his return. If the Company had acted in good faith upon Joe's return, the Company would have told Joe all of the important details of the new job the Company offered him. The mere fact that the Company was *willing* to give a negative answer to a possible question about the permanency of the new job does not excuse the Company from volunteering such negative information; only a sophisticated worker would inquire into the permanency of a job under the present circumstances—and Joe is not a sophisticated person.

Rarely does an opportunity come along to push a marginal employee out the side door as in the present case: getting Joe to accept a job that is about to go out the side door. But moral and legal sanctions for such company action must be predicated upon a "meeting of the minds." Because Joe did not have all the important facts in his new job before he agreed to transfer, it is difficult to see how the Company can satisfy this meeting-of-the-minds legal (and moral) contract test when it offered Hill the new job in Department G—despite other contract tests this case satisfies ("offer and acceptance").

Another question that should be

answered before this grievance is resolved is: *Does a three-day period of absence constitute one absence or three absences under the terms of the present contract?*

Because the contract does not specify that each day of a multi-day absence is an absence, each multi-day absence must be considered as a single period or single absence. But even if the Company had a sound or rational basis for calling each day of a multi-day absence a single absence, it is still doubtful whether it could shorten the 3-step disciplinary procedure under the terms of the present contract. There is a definite implication in the present contract that: Discipline Two (5-day layoff) shall precede Discipline Three (Discharge); and Discipline One (Written Warning) shall precede Discipline Two.

RECOMMENDATION: Because Joe Hill's 3-day absence was his first in over 12 months, his unexcused absence penalty should not exceed a written warning. Because important information about Hill's new job in Department G was withheld from him, there is no moral or legal obligation on Hill's part to continue on this new job. The Company should, therefore, return Hill to his old job as soon as convenient (along with a written warning about his three days of unexcused absence on his old job).

## 2. Piece Rate Challenge on New but Similar Job

*"The Union grieves on the piece rate on the new HT hub cap."*

UNION: "The new HT hub cap has about half the buffing surface that the old HS cap had. Hence the Company has used this as an excuse for cutting the piece rate in half on the theory that half the surface takes only half the time. Incentive buffers when working on the old HS cap averaged \$4.00 an hour. With the piece rate cut in half, these buffers now average only \$2.70 an hour. And they are working just as hard as they did when they were buffing the old larger caps. We believe the Company has used this new cap as an

excuse for tightening up on a good piece rate. While it is true that piece rate buffers, according to the contract, are supposed to average \$2.60 an hour the contract also says that no piece rate shall be cut by an amount greater than a change in the design of a job or the methods improvement involved. There is not a 50% reduction in the total time it takes to buff a small HT cap compared with the larger HS cap because of other job elements besides the actual buffing (handling time is about the same, for example). In other words, with the same effort, the HT buffers should be making the same hourly rate (\$4.00) as they made formerly."<sup>3</sup>

### Analysis and Recommendation of Grievance No. 2

Although the contract calls for a base rate of \$2.00 an hour for buffers with a 30% differential for normal operators working at incentive pace, this does not entitle the Company to re-establish piece rates that formerly yielded \$4 an hour merely by changing *methods*. But the change in the form or size

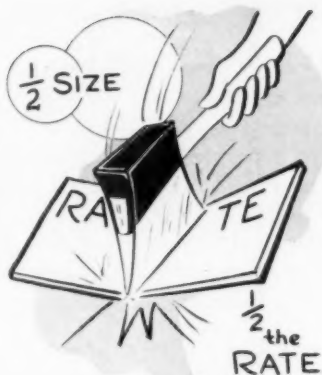
of a product converts the product into a new *product* even though many of the old methods or motion patterns are used in fashioning the new product. (A Ford may look similar to a Lincoln; but there are enough manufacturing differences between these two cars to warrant differences in piece rates in the

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<sup>3</sup>The Union figures did not check with the Company's in every instance. But the end results were sufficiently close that the final recommendation was the same regardless of what set of figures the writer used. Where there are wide differences in such figures the writer follows his usual practice of stepping out onto the production floor and making his own quantitative appraisal of the dispute.

manufacture of each—if each is built under piece work conditions).

The Company has the right, by its present contract, to set a new piece rate on every new product it runs through its factory. Such new product piece rates do not have to match old product rates—beyond the contract provisions. In the present case this contract provision calls for \$2.60 an hour for incentive buffers putting forth good (normal) incentive effort—not \$4.00 an hour. The fact that the buffers on the new HT small caps are averaging \$2.70 an hour is ample evidence of the fairness and accuracy of the new incentive rate on this new item. If the buffers were averaging less than \$2.60 an hour and were exerting full incentive skill and effort, then further inquiry would be necessary; or, if, by a change in job design or methods, a new piece rate was established on the old RS cap that substantially reduced the \$4 hourly earnings on this cap, then there would be a contract violation. To be sure the



smaller hub cap may require slightly different handling which might be constructed as a different method. But the major difference between the new RT cap and the old RS cap is a difference in product design—not job design.

**RECOMMENDATION:** The new Company piece rate on the RT hub cap which is currently yielding \$2.70 an hour should stand as it is, well within the meaning and scope of the contract.

### 3. Overtime Denied Senior Man

*"We demand two hours of overtime pay for Sam Katz who was not called in when a fan motor failed."*

UNION: "Shortly before quitting time, October 15, an exhaust motor conked out. The maintenance foreman told Sam, the plant electrician, to look after this the first thing in the morning. After Sam left for home, the foreman recalled

a small fire the Company had in another department a few years ago because of the collection of gases in a poorly ventilated portion of that department. So the foreman got busy and rigged up a series of small fans to exhaust gas accumulations during the night. This make-shift arrangement took the foreman two hours which rightfully



should have gone to Sam.

"The contract says that no salaried supervisor shall do any productive or maintenance work except in extreme emergencies. We don't believe this was an extreme emergency. But even if it were an extreme emergency, the Company had two courses of action open

to it: (a) The foreman could have asked Sam to remain overtime to put in the make-shift ventilating arrangement which he improvised. Or (b) the Company could have called Sam back after he left, if the supervisor subsequently thought there was danger which he did not realize before Sam left.

### Analysis and Recommendations for Grievance No. 3

Even if the chances were 10 to 1 against any fire or explosion happening during one night of non-ventilation, would these odds be sufficient to cause a prudent person to allow a condition like this to exist—even for one night? The probability is that any prudent person, remembering the earlier fire, would have introduced some kind of ventilation during this 16-hour non-working period; so the maintenance foreman acted prudently when he finally decided to set up some kind of make-shift ventilation.

But the reduction in this hazard could have been accomplished by the electrician whose work this

normally is. The extra 90 minutes it would have taken for the electrician to return to the job, thus delaying by 90 minutes the temporary repair of the ventilating system, would not have resulted in an "extreme emergency." The foreman, although using good judgment in doing something about this dangerous condition, did not adhere to the spirit and wording of the contract with respect to the prohibition of supervisors doing production or maintenance work.

**RECOMMENDATION:** Pay the grievant (Sam Katz) two hours of overtime pay.<sup>4</sup>

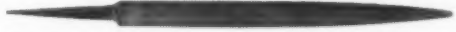
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<sup>4</sup>Although such a recommendation may be repugnant to some management people, the Company in the present instance really made money by the foreman's belated action. Another section of the contract provided for a minimum of four hours of work (and pay) for anyone called in after hours or on Saturdays or holidays. Thus the Company got by with three hours of pay in the present instance instead of six hours (this company does not pay for the overtime work of foremen).



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#### 4. Failure to Give Sufficient Layoff Notice

*"We claim pay for 2 millwrights who were laid off on a Thursday and a Friday without sufficient notice."*

UNION: "The Company has followed a practice of notifying all employees 24 hours in advance of any layoff. Indeed, because of its weekly scheduling of its work, most people know by Friday how many days they will be working the following weeks. Because of this past practice the Union did not argue with the Company when they wanted to include a 16-hour notice of no-work in its present contract. But even with this 16-hour notice in the contract, the Company has followed its usual custom during the first eight months of this contract of giving everyone at least 24 hours notice of temporary layoffs.

"On Wednesday, October 23, just at quitting time, Millwrights Davis and Jones were told by their foreman not to come in on Thursday or Friday, October 24 and 25. The foreman told them he had just come from a meeting where it was decided to move some plant equipment; to reduce the amount of interruption to production, it was decided to move this equipment Saturday and Sunday. So the foreman asked Davis and Jones to stay at home Thursday and Friday and to come in Saturday and Sunday (overtime days).

"Because the Company violated its usual practice of giving layoff men at least 24 hours of notice, the Union asks that these two Millwrights be paid two days for the Company's failure to provide them with work October 24 and 25."

#### Analysis and Recommendations for Grievance No. 4

The Union raises an old question here—a question that frequently comes up when companies seek relief under somewhat similar circumstances: "Which takes precedence, past practice or the written contract?" The answer seems obvious to the writer: "The written contract." Indeed, the chief reason people put ideas into writing is to focus attention upon the precise contractual understanding they agreed to when they put their sig-

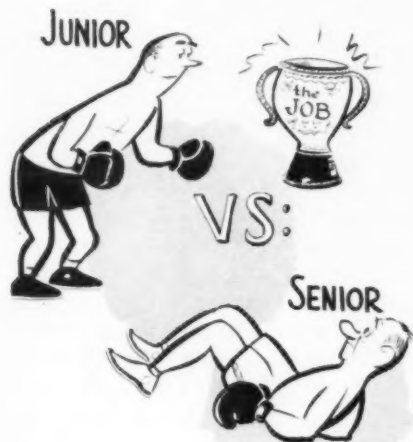
natures to their contract. If one party to a contract chooses not to exercise all or some of his contractual rights (or only to exercise them on occasion), this is his privilege. Indeed, it is significant that the Company in the present case, after years of following a 24-hour notice practice, inserted into its present contract the 16-hour notice clause. The time to change this clause or any other part of the contract is not when two men feel

hurt by it but at the contract negotiating time.

**RECOMMENDATION:** Stick to the contract and deny the Union their claim for back pay. Ask the Union if they would prefer that the Company, in the future, withhold all

layoff plans until 16 hours before the next clock-in time (as a constant reminder of the 16-hour notice clause in the contract). If that's the way they want it, let them have it that way and instruct all supervisors accordingly.

### 5. Junior Man Retains Job While Senior Man is Laid Off



*"We deny the Company's right to keep a junior man on in Department H while a senior man is laid off."*

**UNION:** "Early this year, because of declining business, the Company announced a policy of retrenchment. Part of this retrenchment program involved the laying off of at least one person in each department.

"Bob Caruso, Class A Machinist with 14 years of service, was laid off while Jim Ketch, Class B Toolmaker with 7 years of service, was

kept on. The contract says this about bumping:

"Senior employees, possessing the necessary qualifications shall have the preference in job bidding; however, seniority alone shall not entitle any bidder to the job."

"Another section of the contract reads as follows:

"Any senior employee has the right to any job within a department of which he is capable of performing after receiving the normal amount of instruction given to other qualified employees placed on such work."

"We demand that Bob Caruso be returned to any job within his department that his senior status entitles him to hold. And, if the Company does not believe Caruso is ready for a Class B Toolmakers job, then let the Company spend the same (normal) time and money in training him for the job they spent in training Jim Ketch for his present job. The Company is too small to carry on apprenticeship training for toolmakers. So they sent Jim Ketch to night school for two years to become a Toolmaker. If this is "normal" training for a Toolmaker, then we demand equal

treatment for senior workers before they are laid off—if that is necessary for them to remain on the payroll. Bob Caruso is a high school

graduate the same as Jim Ketch; so we believe Bob can learn to be a Class B Toolmaker in 2 years just as Jim Ketch learned.<sup>5</sup>

#### Analysis and Recommendations for Grievance No. 5

Was the amount of instruction the Company gave Jim Ketch a "normal amount of instruction?" If the answer is "yes" then there is little doubt but what Caruso should be recalled (with back pay) and trained for Ketch's Class B Toolmaking job. If the Company did not envisage outside training or instruction as "normal" but had in mind merely the short informal instructions usually given an operator on a new job, it should have "spelled out" this connotation either in the body of the contract or in a glossary at the end of the contract. Thus the overt acts of the parties govern when the meaning

of a contract clause is not clear. In the present case substance and meaning was given to "normal amount of instruction" when the Company trained, at Company expense, Jim Ketch for a Class B Toolmakers Job. It can do no less for the senior man, Caruso—assuming Caruso can pass the night school courses which Ketch took and which are deemed necessary for the job of Class B Toolmaker. RECOMMENATION: Recall Caruso (with full back pay) and either put him back on his old job or give him Ketch's job with the same amount of training the Company gave to Ketch.<sup>6</sup>

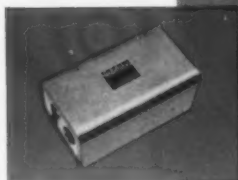
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<sup>5</sup>In discussing this case with Company executives, later, the writer learned the Company was extremely anxious to keep Ketch almost at any cost. Indeed, the Company had plans for making him foreman of the department in another two years after the present incumbent retired.

<sup>6</sup>The Company should guard against comparing the performance of Caruso with that of Ketch. The test of acceptable performance is not whether Caruso measures up to the *superior* performance of Ketch. The test of acceptable performance is whether Caruso measures up to an *average* Class B Toolmaker. What this level of acceptable performance is the writer will not attempt to define. Aptitude test scores, trade school class grades, craft written and performance tests, all give some objective answers to the question: When is a Class B Toolmaker not a Class B Toolmaker? It is, of course, much better to have a battery of such tests and minima scores on hand and in use *before* such a situation arises as in the present grievance.

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## In 2 Parts—Part 2

By **John A. Mueller**  
Manager, Grinding Laboratory  
Bonded Abrasives Division  
The Carborundum Company

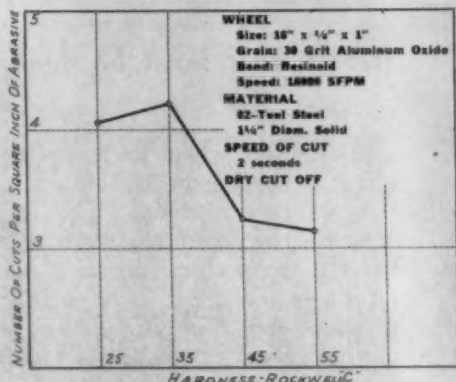
● To expand the story on cut-off, a series of tests were run to determine what effect the hardness of the material that is cut has on wheel performance. Figure 6 shows that wheel efficiency varies with the hardness of the material but not in a straight line relationship. Materials with a hardness less than Rockwell c35 broke the wheel down faster than materials with a Rc35 hardness. Materials harder than Rc35 likewise broke the wheel down at a more rapid rate.

### Hardness of Material

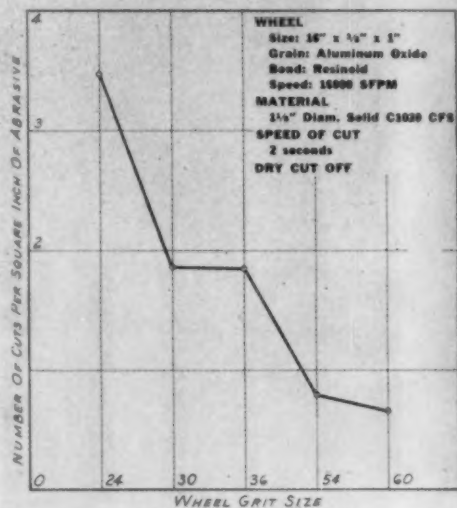
From a wheel selection point of view, Figure 6 shows that soft materials are not the easiest to cut and therefore maximum efficiency cannot be expected from a wheel that is used to cut both hard and soft materials. Generally the softer the material is, the harder the grade of the cut-off wheel can be. In cutting the harder materials another factor must be considered—namely, burn and check of the material. Too hard a wheel will burn and check the workpiece so that a general trend is to use a softer wheel when cutting hard materials.

### Abrasive Wheel Grit

Up to this point the abrasive cut-off wheel has not been considered, but only the factors that make up the cut-off operation. Now the ab-



6. Wheel efficiency varies with the hardness of the material but not in a straight line relationship.



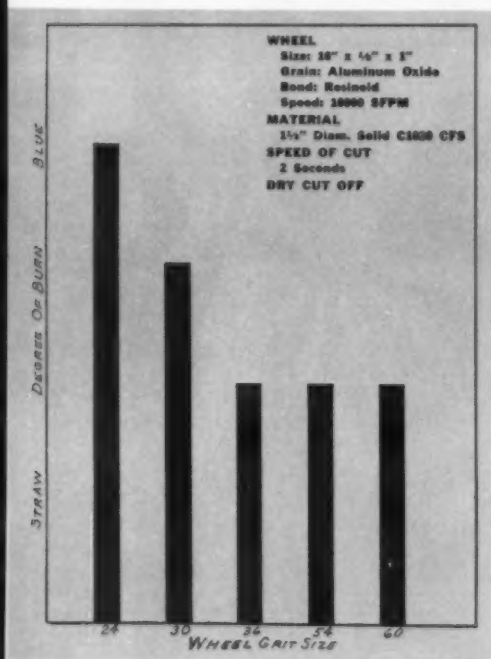
7. The coarser the grit wheel, the highest wheel efficiency. When the grit size becomes finer, wheel efficiency decreased.

## *Here's what must be done to get your money's worth from*

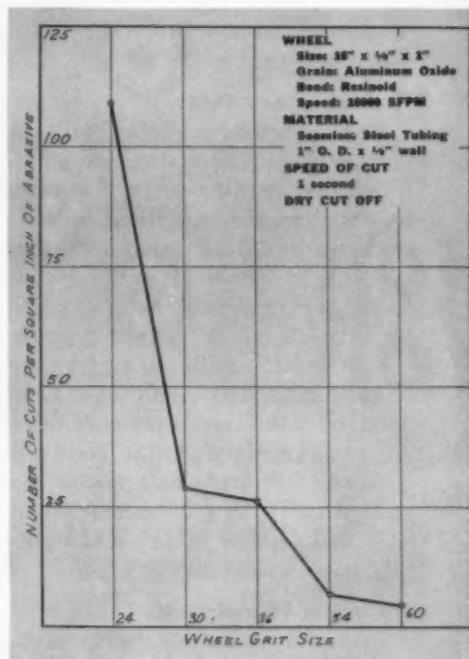
rative cut-off wheel itself and the effect it has on the cut-off operation will be considered.

Grit size provides a method of varying the performance of a cut-off wheel to adapt it to the requirements of any specific operation. In normal cut-off operations grit sizes range from coarse 24 grit to fine

100 grit. How much change in wheel performance can be effected by a change in grit size is shown in Figure 7. This graph obviously shows that the coarser grit wheel produced the highest wheel efficiency and that when the grit size became finer the efficiency decreased. A change from 24 to 30



**8. Coarse grit wheels produce a quality of cut that is inferior to finer grits.**



**9. The effect of change in grit size when steel tubing is cut.**

## **your abrasive cut-off wheels**

grit cut wheel efficiency 45%. Changing from 30 to 36 grit affected wheel efficiency very little. However, a change from 36 grit to 54 grit produced a 31% drop in wheel efficiency and a further decrease of 40% occurred when the grit size was changed to 60 grit.

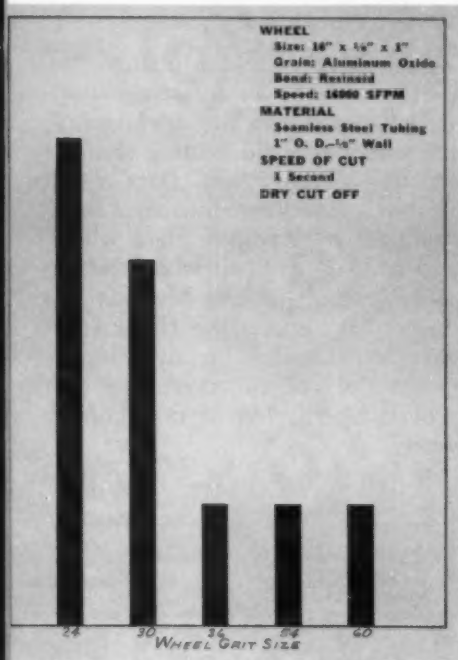
*From the wheel efficiency*

*point of view, it is evident that grit size can change wheel efficiency as much as 80%.*

If long life is desired, coarse grit wheels are the proper wheels to use. Figure 8 shows the quality of cut produced with various grit size wheels when cutting solid bar stock. This graph points out that the coarse grit wheels produced a quality of cut that is inferior to the finer grits. As the grit size became finer the quality of cut became better. Quality of cut and wheel life, therefore, oppose each other. If superior quality is desired it must be produced at the expense of wheel life and conversely if long wheel life is desired, quality of cut must necessarily be sacrificed to obtain it.

*As in most operations involving the use of abrasives a compromise must be effected and in cut-off work these data show that a 30 or 36 grit wheel is a logical compromise between superior quality of cut and long wheel life.*

Figures 9 and 10 show the effect of a change in grit size when steel tubing is cut. The major difference between solid steel and steel tubing is the amount of area that is cut off. Two factors are apparent from an examination of Figures 9 and 10. The first is that the wheel efficiency when cutting tubing is much higher than when cutting solid stock of the same diameter. This is logical and reasonable because the smaller area that is cut the less it would wear



**10.** Another example of the effect of change in grit size when tubing is cut.

the wheel. The second factor is that the quality of cut produced by the finer grit wheels is better when cutting tubing than when cutting solid stock. Again this appears logical because of the decreased area and the consequent reduction of heat that is generated.

The effect of a change in grit size on wheel efficiency, when cutting tubing, followed the identical pattern that appeared when solid steel bar was cut. As the grit size became finer, the wheel life went down. Quality of cut in like manner followed the pattern of the solid bar stock. Finer grit wheels produced better quality cuts than coarser grit wheels, but have shorter life.

Typical of the cuts that are produced by various grit size wheels are those shown on Figure 11. They range from a blue burn to no burn and from a heavy burr to no burr.

The effect of grit size on wheel action may be summarized as follows:

1. Grit size can change wheel efficiency as much as 80%.
2. Grit size can change quality of cut from blue burn to no burn.

3. Coarse grit wheels produce long life but quality of cut is sacrificed for it.
4. Fine grit wheels produce excellent quality cuts but wheel life is sacrificed for it.
5. A compromise between excellent quality and long life is the selection of medium grit wheels for the job. 30 and 36 grit wheels will give good quality cuts with reasonable wheel life.

### Wheel Thickness

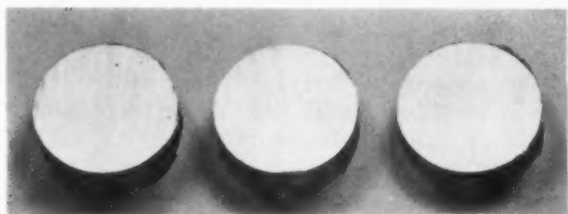
Just as grit size can change the performance of an abrasive cut-off wheel so also can the thickness of the wheel alter the cutting characteristics of the wheel. Data sheet II shows typical performance data produced by a 1/16 in. thick wheel and a 3/32 in. thick wheel in the same grading. Wheel life was reduced 53% when the thickness changes from 3/32 in. to 1/16 in. Quality of cut, however, was improved by the use of the thinner wheel.

It follows, therefore, to obtain

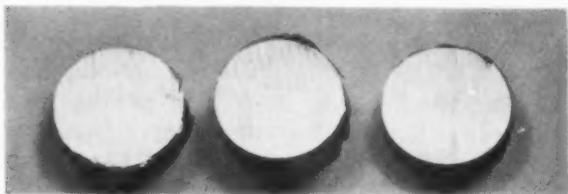
**Data Sheet II—Performance of 1/16-in. Wheel and 3/32-in. Wheel**

Machine: .....	Delta Cut Off	Time Per Cut: .....	1 second	
Wheel Size: .....	10-in. diameter	Number of Cuts: .....	50	
Wheel Speed: .....	4000 rpm	Cutting Fluid: .....	None—dry cut off	
Material Cut: .....	1/2-in. diameter C1020 CFS			
Wheel Grading	Wheel Thickness Inches	Diameter Loss Inches	No. of Cuts Per Sq. Inch Abrasive	% Change
36 Grit "ALO" Resinoid .....	.103	.099	32.1	53
36 Grit "ALO" Resinoid .....	.067	.187	17.1	100

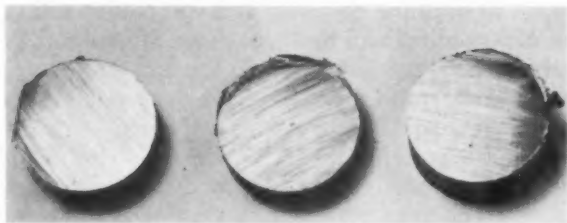
## Quality of work done as speeds and/or grit sizes are varied



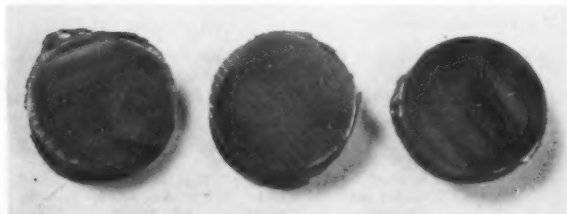
**Excellent quality.** Slight burr; no burn. Fast cut with fine grit wheel.



**Good quality.** Light burr; no burn.



**Medium quality.** Medium burr; trace of burn.



**Poor quality.** Heavy burr; blue burn. Slow cut with coarse grit wheel.

**Requirements of the operation should dictate which abrasive**

the most cuts from a wheel, use as thick a wheel as is consistent with the power available. Conversely to obtain better quality of cut use a thinner wheel.

**Abrasive Wheel Grade**

Wheel grade or hardness of wheel also contributes to and controls to a great extent the cost of the abrasive.

The extent of the control that is exercised by the grade of the wheel is shown on Data Sheet III. These data clearly point out that a change of 2 grades in wheel hardness produced a 37% decrease in wheel life or a 37% increase in abrasive cost. A change from a T grade wheel to a V grade wheel also produced more heat that was reflected in the ability to maintain close parallelism of cut. Obviously then, a harder grade wheel will produce more cuts per wheel but will generate more

heat and impair the quality of the cut. While these data reflect what happened in one situation and may not be used as a general indication of what may happen in a different situation, they definitely point out that wheel grade and wheel cost are related very closely to a great extent.

To select the optimum wheel grade for any one job is relatively easy. To generalize on wheel selection, however, is more difficult because of the many factors that affect the selection of an optimum wheel grading. These factors include such things as:

1. Type of material.
2. Area of material.
3. Production requirements.
4. Power available on the cut-off machine.
5. Condition of machine spindle and bearings.
6. Quality of cut required.

**Data Sheet III—The Effect of Wheel Grades on Cost**

Machine: .....	Campbell Cut Off	Time of Cut: .....	2 seconds
Wheel Size: .....	16-in. x 1/2-in. x 1-in.	Number of Cuts: .....	25
Wheel Speed: .....	16000 sfpm	Cutting Fluid: .....	None—dry cut off
Material Cut: ...	1 1/4" diameter C1020 CFS		

Wheel	Wheel Thickness Inches	Diameter Loss Inches	No. of Cuts Per Sq. Inch Abrasive	% Change	Maximum of Parallelism Inches
"ALO" Resinoid T Grade ..	.128	.570	1.76	100	.006
"ALO" Resinoid V Grade ..	.126	.361	2.76	63	.010

## ***cut-off wheel to select***

How the type of material, the rate of cut and the available power affect wheel performance have already been outlined in the preceding portion of this article. With this as a background, there are a few general conclusions that may be resolved concerning the choice of a wheel grade. These are as follows:

1. When cutting hard materials use soft grade wheels.
2. When cutting soft materials use hard grade wheels.
3. When cutting large areas use soft grade wheels.
4. When cutting small areas use hard grade wheels.
5. When using low powered machines use soft grade wheels.
6. When using adequately powered machines use hard grade wheels.

### **Conclusion**

From all these data that were compiled under controlled conditions, the following factors will direct the way to optimum cut-off wheel efficiency and enable users of abrasive cut-off wheels to reduce their costs and improve their operation. These factors are:

1. Operate wheel at manufacturer's recommended speed.

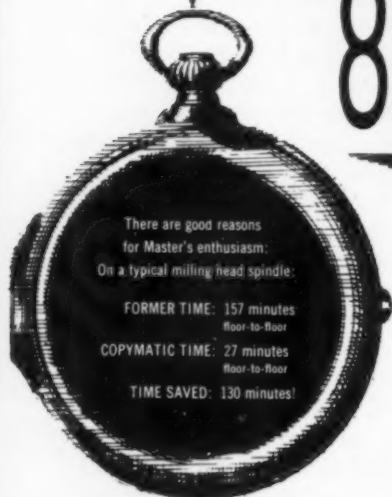
2. Maintain constant wheel SFPM.
3. Provide adequate horsepower on all cut-off machines.  
10 in. wheel—min. of 3 h.p.  
16 in. wheel—min. of 7.5 h.p.  
20 in. wheel—min. of 10 h.p.  
A rough approximation of horsepower required is 1/3 h.p. for each square inch of steel cut per minute.
4. Select the abrasive cut-off wheel according to the requirements of the operation:
  - a. For long life use coarse grit wheels.
  - b. For superior quality of cut use fine grit wheels.
  - c. To cut large areas use soft grade wheels.
  - d. To cut small areas use hard grade wheels.
  - e. To cut hard materials use soft grade wheels.
  - f. To cut soft materials use hard grade materials.
  - g. A wider wheel will produce longer life, generate poorer quality and require more power.
  - h. A thinner wheel will produce shorter life, generate superior quality and require less power.
5. Recognize that production rate, available power and abrasive costs are directly related.
6. Realize that total cost consists of abrasive cost and labor cost together with time of cut and quality of cut. • • •



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3074 Colerain Ave., Cincinnati 25, Ohio

# Scientific vs Add-on Turret Lathe Design

Will the fresh scientific design approach be as fruitful as it has proved to be with the automatics?

By **C. T. Blake**  
Director of Engineering  
The Warner & Swasey Company

● The turret lathe started out, obviously, as a glorified engine lathe having a turret added to it in place of the conventional tailstock. Through the years the "add-on" process has been pretty much the history of turret lathe development; it's been an empirical process of expanding or improving a basic concept, rather than a fresh, scientific design approach.

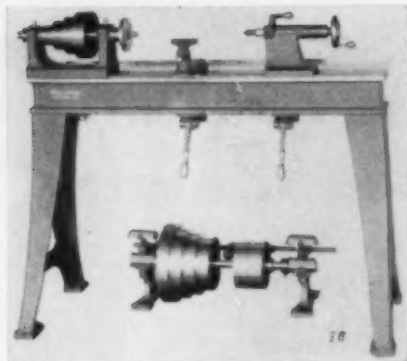
## *What has been "added on"?*

Power feeds were added to the turret unit, then came a cross slide unit, then power feed for this cross slide, eventually making it possible to power feed in both directions, cross and longitudinal. Today we call a machine of this type a universal turret lathe.

Next, attention was given to headstock gear trains, with more and more speeds and power being

available. Anti-friction spindle bearings were developed for machine tool use—primarily to insure retention of accuracy. Rapid traverse motions were added to the hexagon turret and to the cross slide. Then more automatic features were added, such as automatic shifting headstocks, electrocycling. These tied the turret stations to spindle speed automatically, single lever controls, preselecting controls, etc. And finally attachments were added for threading, taper turning and contouring.

All the while the machine became larger and more rugged to satisfy the pressures for more power, speed and durability. Overhead pilot bars to help support the tool holders under heavy hogging cuts came along pretty early in the development process. And throughout the evolution, new components were incorporated as fast as they could be perfected.

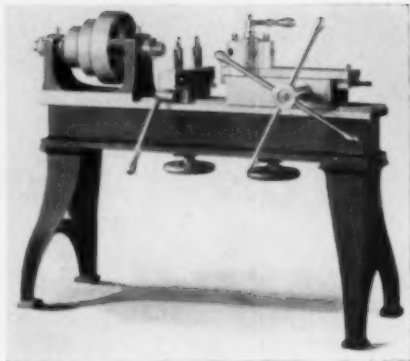


1880—A 12-inch hand lathe.

***Turret lathe designs are a continual compromise.***

For instance, it is necessary to make a compromise between ease of handling and greater mass and rigidity. If we make the slides and moving elements too rigid and heavy, we lose ease of handling features, remembering that this is still a hand-operated machine. This is the only real reason for the ram-type turret lathe design; to provide a relatively small and light weight slide that can be positioned anywhere along the bed.

Compared to the saddle-type design for the larger, heavier machines, the ram design contains several evils. For instance, length of the slide stroke limits working length, and as the slide is moved towards the spindle during its working stroke, it overhangs in the air more and more, bends with the

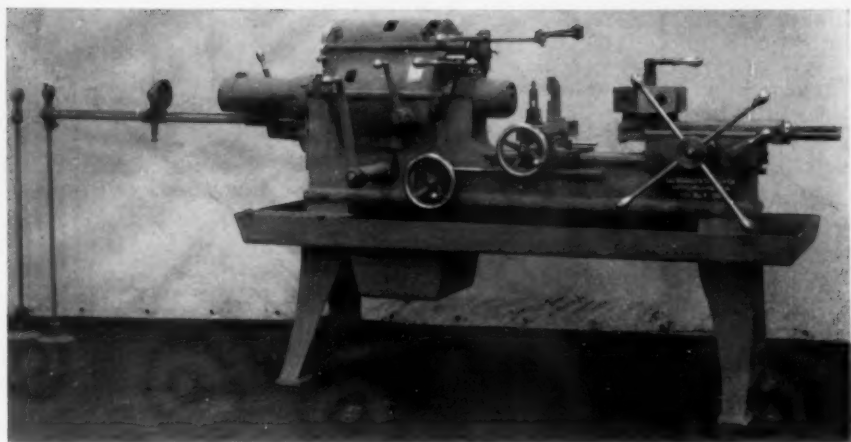


1881—A 16-inch Monitor lathe.

weight of the tools and pressure of the cut, and loss of accuracy results. And, of course, there are a multitude of surfaces to keep lined up as contrasted to the simpler saddle-type design where the whole unit moves along the ways.

***It usually is necessary to compromise accuracy for power and speed.***

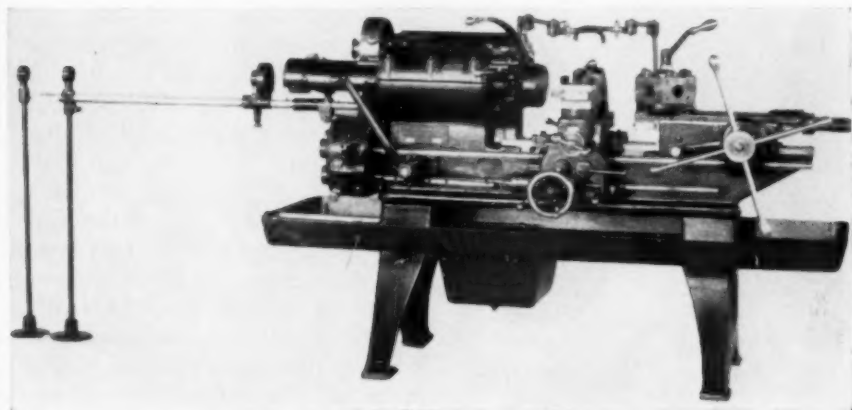
Obviously, if you wanted nothing but accuracy and cared little about other factors, you could build a turret lathe just about as accurate as you specified. But as a general purpose machine, it is supposed to be able to deliver a high power and high speed cut, then an accurate finishing cut in successive operations. This doesn't seem too tough on the face of it, since metals deformed within elastic limits under high pressures can be expected to spring back



**1913**—No. 4 turret screw machine, specially adapted for motor drive by belt from motor on floor, wall or ceiling. It featured an all-steel geared head; single pulley drive; standard automatic chuck, bar feed, cut-off; hollow hexagon turret having geared power feed, pan, pump, etc. Six spindle speeds: 36 to 450 rpm.

to original positions for the lighter, more accurate cuts. However, this doesn't take into account other factors, such as the heat generated by more power and speed. *Heat*

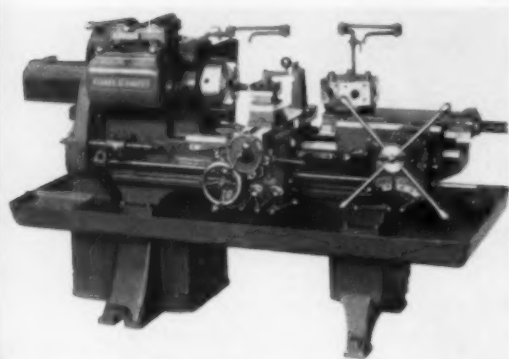
*in headstocks has plagued the turret lathe designer for years and is a good example of a basic fault in turret lathes today. As the headstock heats up and expands, the*



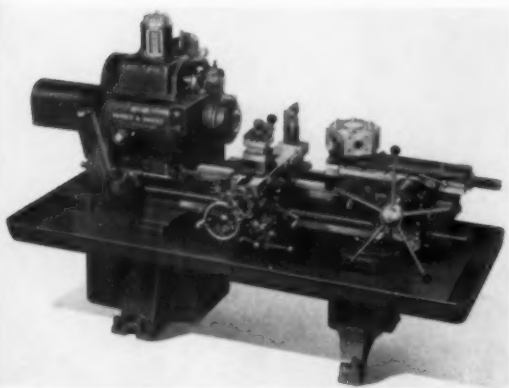
**1920**—No. 4 universal turret lathe with power feed to turret and cross slide. Has 12-speed head. Feed selection lever is at head end.

## TURRET LATHE DESIGN continued

lay of the spindle centerline relative to the bed moves upward and sometimes to one side, and the bed itself sometimes jackknifes to a certain extent. With the kind of accuracies we are talking about today, this is a real problem.



1934—No. 4 universal turret lathe has 12-speed Timken bearing head. Feed selection is in aprons.



1945—No. 4 universal has speed preselector and direct reading sfm—rpm—work diameter dial as added features.

### *Another major compromise in turret lathe design is location of controls.*

Take, for instance, the feed controls for the turret and cross slide gear boxes which we call "aprons." We moved these elements from the head end of the machine many years ago and put the feed changes and controls on the apron itself, so they would be more convenient for the operator. But in doing this we added to the weight of the sliding units, making them harder to operate. In addition, everything now stuck out further towards the operator's belly, so he had to reach further to handle the work and to adjust his tools.

### *We have had to compromise with speed, too.*

A wide range of speeds is needed in a turret lathe: a low range for threading—still done today largely with high speed steel—and high speeds to make use of the new carbides and ceramics. Ideally, we would like an infinitely variable range of speeds, and a lot of ideas on how to accomplish this have been tried. Of course, if you want, you still can use one of the variable speed drives of various types that have been available commercially for several years. Actually, however, with present know-how, bearing developments and proper lubrication, turret lathe speed and range of speeds are almost unlimited, except as influenced by

cost and the problem of heat I mentioned earlier. Here, as in many other areas the compromise often must be with cost.

***Now let us look at the scientific approach.***

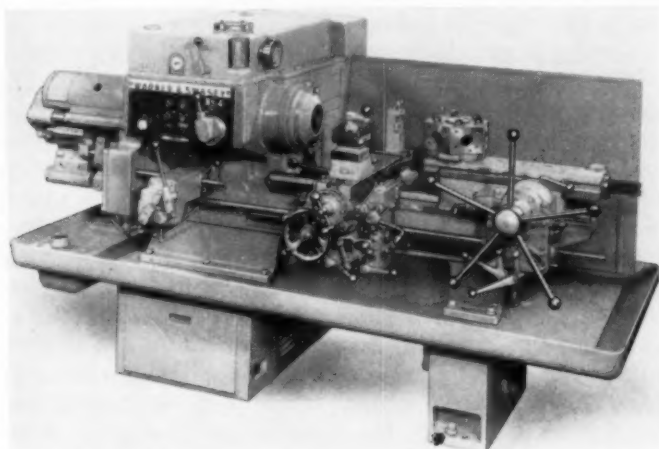
A completely fresh look was taken at machining practices shortly after World War II, and a scientific design approach was adopted in an effort to solve many existing turret lathe problems, using conventional design only as far as it fit this new approach.

The result was our single spindle chucking machine—recently also made available as a bar machine. This is an interesting design development that actually gets around many of the turret lathe problems and compromises I have mentioned. It is an example of what can be done if you are not satisfied just

to expand or improve an existing design and are willing to substitute the scientific for the “add-on” approach. It’s a case, you might say, of an engineer’s dream seeing reality.

When you look at the single spindle automatic, the first thing you see is that instead of the conventional method of mounting a turret on a base, or bed as we call it, the bed in effect has been cut off and folded up on top of the spindle. As a result, when the spindle rises with heat, so does the turret. They move as a unit, so that one of our major turret lathe faults has been circumvented almost completely. The high accuracy of this machine is partly due to this design.

Controls are automatic, of course, but there are manual ones—switches and knobs for setup—which have



**1955—No. 4 universal; headstock has 12-speeds and is equipped with hydraulic clutch; direct mounted motors; 24 speeds, 2-speed motor.**

## TURRET LATHE DESIGN continued

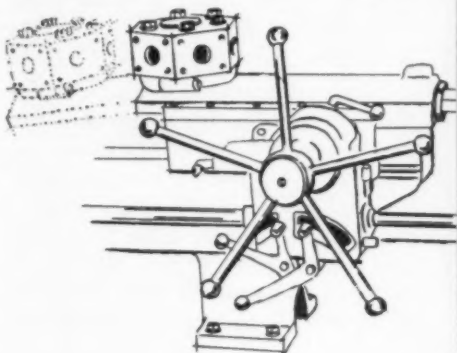
been made easy to reach and yet are not in the way of chips or functional units. In fact, in designing all controls and adjustments, particular attention was paid to the need for quick, easy setup. The turret and spindle stay in alignment as a unit. A turret lathe only stays that way if it is kept properly leveled and at constant or controlled temperature, and if the various gibs and sliding elements are kept properly adjusted.

***There are compromises in single spindle automatic machine design, too.***

For instance, the swing or maximum diameter of work is limited by the cross slide arrangement and also by the turret bar itself, which is placed as close to the spindle as possible to reduce cutter overhang on small diameter work. Fortunately, most heavy cuts from the turret are on larger diameters where, in this design, cutter overhang is most advantageous. This is the opposite of the condition existing on hand turret lathes. Also, the maximum length of work the "AC" machine can handle is a compromise with index time and overhang of the turret bar itself.

Our multiple spindle automatic design resulted from a desire to achieve a machine with improved accuracy and much reduced setup time to fill a market need in between low volume and high volume production, and to bring the ad-

vantages of this type of automatic machine to work requiring high accuracy. I think that possibly the biggest fault we could find with this machine is that it is costly to manufacture. On the other hand, if we started out from scratch today to design a machine to do what this one does, we probably would end up with just about the same arrangement. Of course, we might



There's more accuracy through the use of fewer sliding joints. Cutter overhang on large diameters must be reduced.

consider some other means for driving the slides instead of mechanical means, but this is questionable.

Our own general design philosophy is to apply the newer techniques in hydraulics, electrics or electronics, wherever these methods produce a better end result, but if we can accomplish the same purpose mechanically, we would rather do so for reliability and often for cost reasons. We use hydraulics to operate clutches and

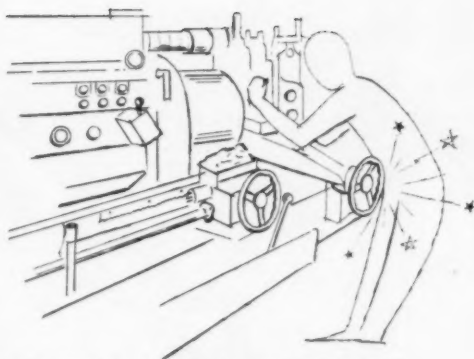


drive slides such as on contour attachments, and we use electrics in practically all of our equipment. Electronic equipment also is being applied, though to a more limited extent. Its future is promising.

Granting that current automatics, both multiple spindle and single spindle, represent fresh, scientific design approaches from an engineering standpoint, and have a fewer number of compromises built into them, it would seem logical to apply this same type of approach to basic turret lathe design. In fact, we have been doing just that, with the hope that we can accomplish the following basic objectives economically:

1. PROVIDE EVEN MORE ACCURACY through the use of fewer sliding joints.
2. ELIMINATE THE EFFECT OF HEAT, or find a better way to compensate for it.
3. GET THE CONTROLS OUT OF THE OPERATOR'S BELLY, yet make it easy for him to reach them and get closer to his work and tools.
4. ELIMINATE THE OVERHEAD PILOT BAR, which limits swing and gets in the way of other tools and attachments. Also, reduce cutter overhang on large diameters.
5. ACHIEVE THE GREATEST POSSIBLE EASE OF OPERATION, regardless of weight and rigidity of moving parts. Of course, this implies full power operation, perhaps with servo-type controls.

At the same time we are striving for other important but less fun-

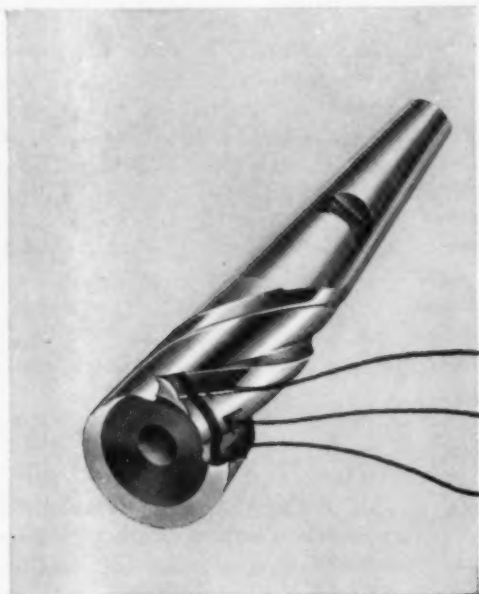


Get controls out of the operator's belly.

damental improvements: better chip disposal, fully automatic lubrication, lower maintenance cost.

All of the above-mentioned turret lathe objectives *can* be accomplished, using a scientific design approach. In varying degrees they have already been achieved in the laboratory. The big problem, of course, is the cost to build such a machine, remembering again that we're still referring to a universal, general-purpose machine for small as well as big shops. If its cost does not bear the right relationship to its advantages, obviously customers will not buy it.

But we are confident that we can solve this cost problem, too—in view of some recent developments of simpler, better, more reliable components to make these new designs and our existing laboratory prototypes practical machines. However, they are still *only* prototypes at present, some in only a bread-board stage to prove principles. . . .



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## Accuracy in Tool Grinding with One Set-up

● No longer is the grinding of single point tool profiles dependent on the operator's skill and ingenuity. Such problems as accuracy, repeatability, set-up and blending of the radius have been solved with simplicity and accuracy with the advent of the Micropoint Tool Grinder. Produced by DeVlieg Machine Co., Royal Oak, Mich., several of these grinders have been in use in their own plant for over a year.

One of several users of the Micropoint tool grinder is The Goss Printing Press Co., Chicago. Standardizing the various tool grinds for their single point tooling, Goss finds the repeat-

ability for the various tool geometries accurate and reliable by setting dials and protractors to previous established standards.

The Micropoint Tool Grinder is designed to grind single point tools of carbide, H.S.S. and ceramic up to 1" square or round. The most distinct advantage is set-up. Set-up for grinding single point tools has always required special fixtures for each tool. Even with fixtures, repeatability is a problem. Set-up of the Micropoint however, is merely a matter of direct dial settings; the dial settings assure repeatability to precise tool geometry requirements.

### **Set-up Procedure**

To further emphasize the ease of set-up on this grinder, the procedure is as follows:

- Align the wheel face to the master setting rod on the side of the spindle.
- Adjust the collar of the spindle for the desired radius.
- Set one of the two protractors for the relief angle.
- Set the stops for the cutting angles.
- Set knobs for left or right offset.
- Place tool in the "V" block so that it is in contact with the wheel face.

All that is left to complete the operation is to feed the tool into the wheel while swinging the tool between the stops for the angles until the finish is reached.

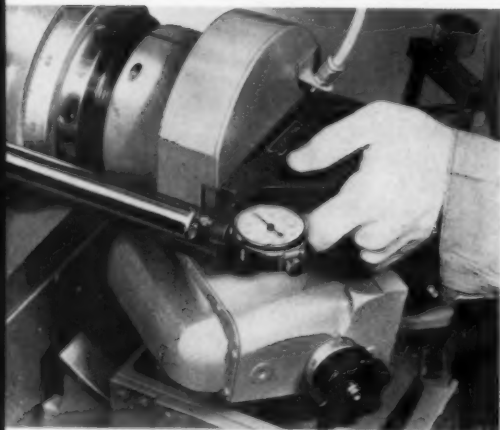
Consisting of a mechanically trav-

ersing wheel head, a work holding assembly and a base, the grinder is capable of grinding all the surfaces of single point tools. All surfaces are ground from one set-up except rake angles. These are ground by rotating the desired angle.

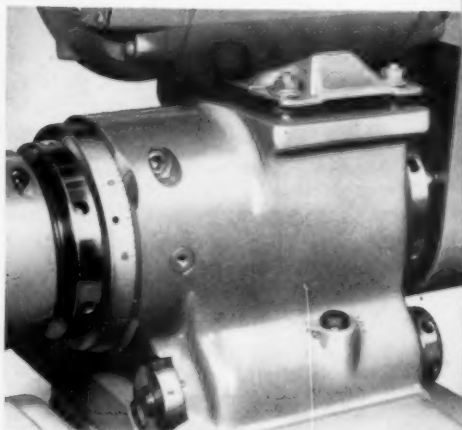
The wheel head is traversed or oscillated by an eccentric control. This oscillation can be adjusted to keep the tool point within approximately .050" of each edge of the wheel. Proper radius control is maintained by keeping the tool point in contact with the wheel during the grinding operation.

Traverse or oscillation is adjusted by a dial on the back of the machine for stroke lengths from 3/16" to 1-1/2". The entire wheel head assembly can be repositioned so that grinding can be performed on either side of the wheel. Spindle rotation is also reversible so that the tool is al-

### **These 5 steps point to ease of set-up on**



**1. Align** the wheel face to master setting rod on the side of the spindle.

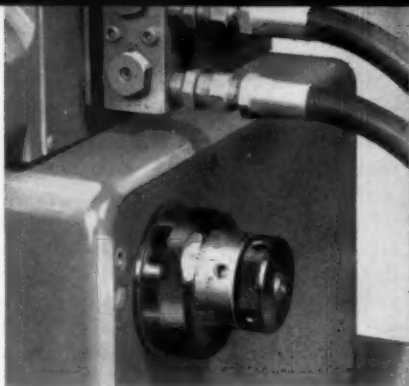


**2. Adjust** collar on spindle for setting the radius.

ways sharpened with the wheel rotating downward. These features provide the flexibility necessary for grinding left or right-hand tools and for facing the tools.

### Work Holding Assembly

The accuracy, geometry and repeatability of this machine is obtained for the most part by a very unique work holding assembly. This assembly consists of two sets of arc-shaped ways which are calibrated by protractors, ranging from 5° on one side of zero to 15° on the other. These two protractors provide the accurate settings needed to obtain either cylindrical or conical relief angles. The cutting edge angles are set on still another protractor located at the bottom of the work holding assembly. This protractor is provided with two stops; each stop is set for one of the cutting angles. The stops are constructed with springs to cushion the end of the stroke for each cutting angle. In set-

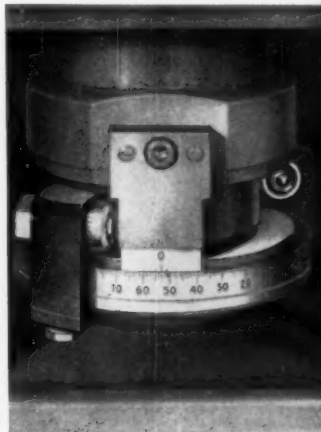
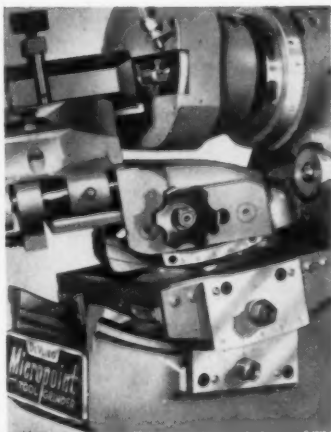
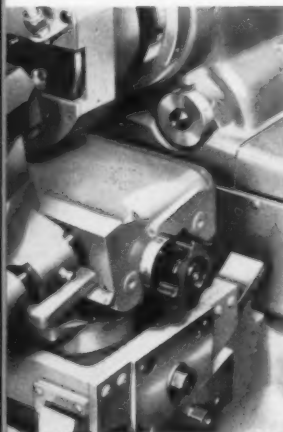


Dial for setting oscillation or traverse of wheel head is on rear of machine.

ting the stops, an offset mark is used to prevent any error which could occur if the spring had to be depressed during setting. Graduations are in increments of one minute of arc.

Offset alignment of the tool is accomplished by right and left hand adjusting knobs on the work holding assembly. The right hand knob adjusts for right hand offset and the left

## grinder—it's a matter of dial readings



3. Left: set one of two protractors for relief angle; 4. Center: set protractor for cutting angles; 5. Right: set knob for offset.

for left hand offset. The dials are graduated in increments of .0005" with total offset adjustment of 1/2".

Radius settings are obtained by adjusting the relationship of the wheel face to the center line of rotation in the work holding assembly. The wheel face is first located from a master setting rod which is positioned in assembly and thus provides a permanent reference point. After adjust-

ment of the wheel face the radius can be set on the graduated dial on the front locking collar of the spindle. The dial is graduated in increments of .0005". Maximum radius is 7/8".

DeVlieg formerly used lapping machines to grind all their tools. They report that wheel life, with the new machine, is five to six times longer. With cone ground radius relief, tool life is increased 15 to 20 per cent.

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## Layout Time Cut 75% at Ingersoll Milling

By **Paul A. Meline**  
Managing Editor

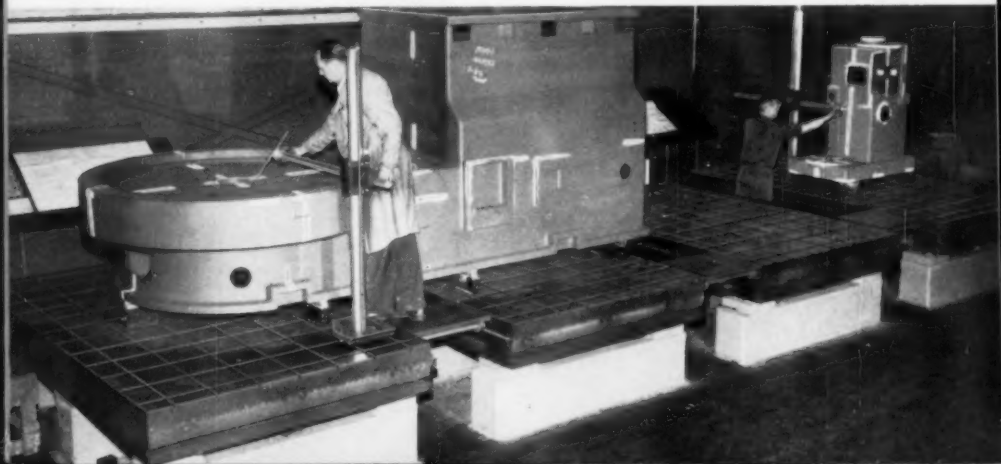
● The type of equipment produced by machine tool builders, such as Ingersoll Milling Machine Company, involves big castings which require a great deal of checking and laying out prior to machining.

The only advances in layout technique up to a year ago to enable five Ingersoll layout men to do their jobs faster and more efficiently had been some slight improvements in hand tools, the angle plates, protractors, master squares, straight edges, surface gages, scribes, etc. Considerable time was required in turning over the casting to expose the remaining sur-

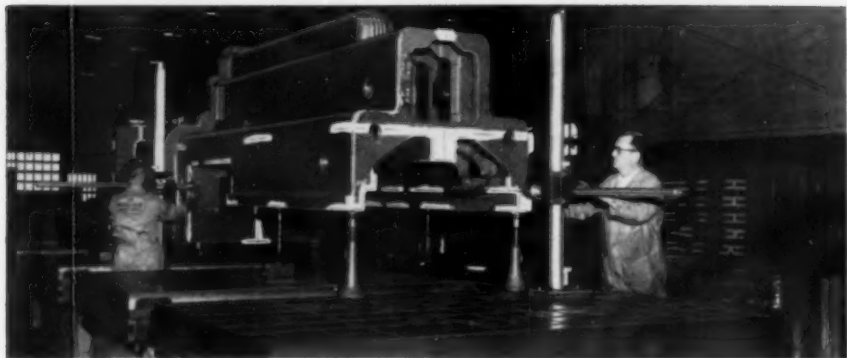
faces for checking. Often the physical size or complexity of the casting required turning of the workpiece a second time.

Today, Ingersoll layout men do their job with the aid of a Layout Machine in one-fourth the time required with conventional hand methods. This instrument was designed and developed by Portage Double-Quick, Inc., Akron, Ohio. The table that holds the workpiece is the same one that was used with the old layout method with one exception: the table was cut into four units. Each unit can be used singly or in multiple. A space of approximately 24" between the units was provided so the layout men have easier access

**Layout man** reaches in with cross arm of machine to establish center line. Part is bed section to be used in 96 in. rotary milling machine. The fourth section of the layout table is being used to lay out a smaller casting at right of photo.







**Cast iron housing** for a 3-spindle boring machine is elevated by jacks. The sliding wedges underneath the high jacks can be adjusted to fractional height dimensions.

to all parts of the workpiece. A sliding plate between each table provides a means for moving the Layout Machine from one table to the next. This makes it possible to layout all four sides, top and bottom, plus checking the inside surfaces with one set-up of the casting.

Wedge-type jacks to provide an effective support of any size casting were designed by Ingersoll engineers. (See illustration.) The sliding wedges can be adjusted to fractional height dimensions. When used in conjunction with the high jacks, the layout man can easily manipulate the scriber underneath the casting.

Ingersoll engineers point to the Layout Machine as a great advancement in layout technique because of the following reasons:

1. It can quickly layout vertical, horizontal, inside and outside layout lines with one set-up of the workpiece or casting.
2. Eliminates hand tools.



**With high jacks** the layout man can easily manipulate scriber underneath castings.

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- hand hack saws
- power hack saws
- band saws
- hole saws
- hammers
- ground flat stock



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## LAYOUT MACHINE continued

3. Ease of operation.
4. Accuracy: It eliminates chance of error in scribing.

Ingersoll discovered that one man working with a layout machine can do in 250 hours what formerly, with hand tools, required 1000 hours. This saving prompted the company to purchase a second machine.

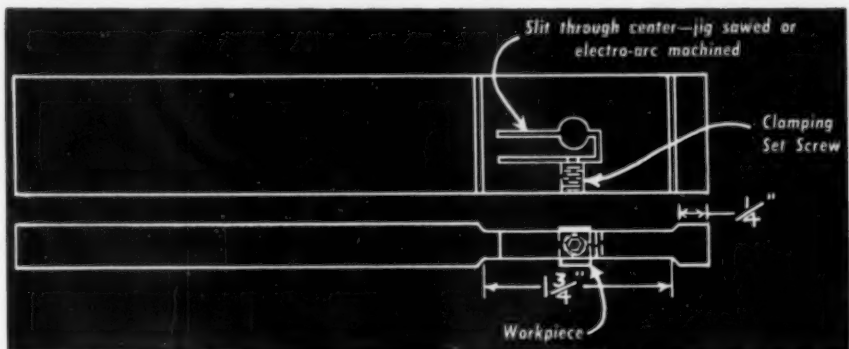
Layout men required only 30 minutes of instruction to learn the fundamentals of operating the machine. It was not long before they were able to operate the machine efficiently. They characterized it as perfect for checking or laying out hole centers, finish allowances and casting cleanup.

The machine rolls easily and accurately on frictionless ball bearing wheels located in the base of the machine, and is guided by rolls engaged in guide slots which Ingersoll machined into the tables. The guide slots are accurately machined at 10" spacings in addition to being 90° to each other.

The guide rolls are disengaged when the machine is moved to the other side of the workpiece being layed out. Other moving parts also incorporate ball bearings and counterweight to give it a "feather touch" ease of operating.

In addition to direct reading scales in .050" graduations, there are separate adjustable vernier scales graduated in .010". There are hand knobs for fine adjustment. Locks are provided on the measuring devices to hold setting while scribing layout lines. With a variety of off-set scribes any unusual pocket, pad, or core can be reached for checking or laying out.

• • •



## Simple Fixture Holds Small Rounds

By **John L. Elliott**  
Tracer Control Co.

● Recently, we had a run of very small tubular spacers of precise length to turn out. The problem was to finish the end surfaces square with the OD, parallel with each other and hold the length to .3125 in. within .0002 in. Since the OD was also held to close limits it would have been an easy grind job using a collet type chucking device except that this would mean:

1. Removing the piece from the collet to turn over for grinding the flip side.
2. Removing the piece from the collet to check size.
3. Very careful placement in the collet to locate against an end stop.

4. Fine opportunities for dirt to lodge between workpiece and end stop.

After a little thought, we parlayed a few man-hours and a six-inch length of 3/8 in. x 1 in. CRS into the solution of our problem with none of the above disadvantages.

Leaving about a quarter inch at one end, we milled a relief 1-3/4 in. wide on both sides of the CRS, making the thickness .281" at that section. Then we drilled a hole that was a few thousandths under the finish OD of the workpiece. This hole was located 3/8 in. from one side of the strip but in the center of the relief. With a metal-cutting jig saw we cut a slit lengthwise of the strip and through the center of the hole in both directions and extending on

## Shop Hints

continued

around it in roughly a U-shape. A set-screw hole was drilled and tapped through to the slit from the nearest side. The CRS was then case-hardened, the total thickness ground down to .030 in. from the relief on both sides, and the hole was jig ground to slip fit the workpiece.

Now we were in business.

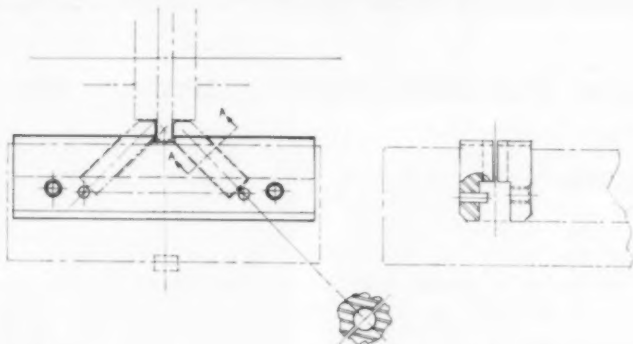
The spacers were cut off about .010 in. over the finish length, hardened, and their OD's finish ground.

Using a conventional surface grinder with magnetic chuck, the finished fixture was placed on the chuck

in line with the spindle, rather than the table. The spacer was then clamped in the fixture, bottoming on the chuck surface.

A cleanup cut was taken, the undercut on the fixture giving us plenty of room for the wheel on both sides of the workpiece. The fixture was then flipped over and the other side of the spacer cleaned up. Now, for checking dimension, the fixture was removed from the chuck and the spacer checked with mikes without even having to remove it from the fixture.

• • •



### Special Vise Jaws For Chamfering Pins

By F. Murray

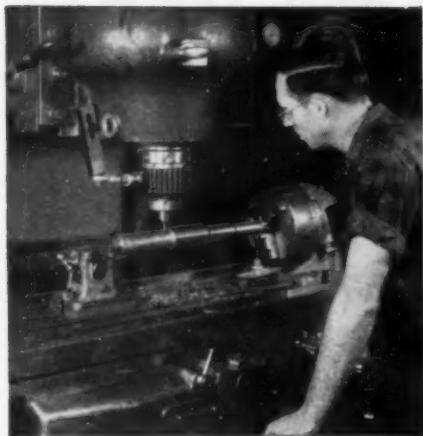
● The vise jaws shown in the illustration were made for holding two cylindrical parts while milling the two 45° chamfers on the ends.

The parts shown in the attached sketch were originally planned to be chamfered with a 90 deg. cutter while held in a specially designed fixture. It was later discovered that no suitable

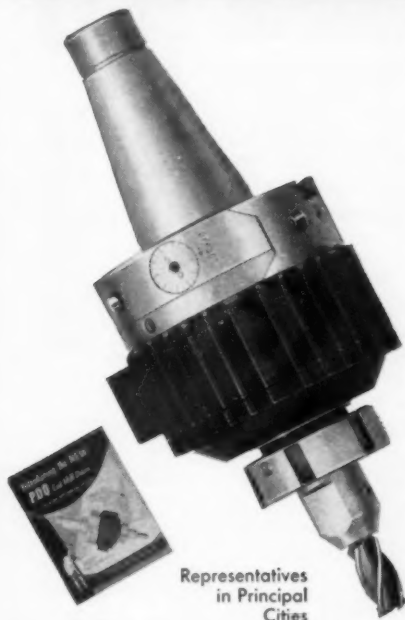
angle cutters were available. As the parts were needed quickly, the vise jaws illustrated were made to be used with ordinary cutters that were in stock.

Setting the parts at a 45° angle made it possible to use two plain and one side milling cutter. Locating the parts as shown also made it possible to mill two parts at a time. The notch in the top of the jaws is used for positioning the cutters; its location being held from the two stop pins.

• • •



## NEW P.D.Q. End Mill Driver... Cuts to Size with **UNDERSIZE END MILLS\***



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in Principal  
Cities

\*Now you can utilize your inventory of undersize end mills and still cut to size. The new P.D.Q. end mill driver can be offset positioned by micrometer adjustment to compensate for undersize mills. In addition, the orbital offset motion increases chip clearance, insures square slots and permits milling true to centerline. One pass cutting of key ways is now possible.

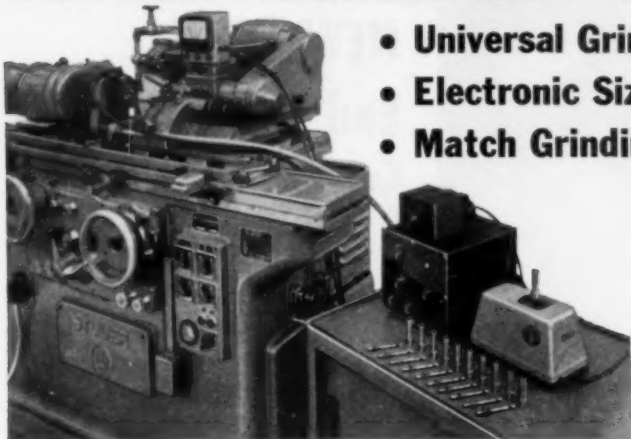
The End Mill Driver has a four to one speed ratio between spindle and cutter which enables the Driver to do the work while the machine actually loads. This new P.D.Q. tool offers a new concept in end mill cutting . . . Write for complete information.



### **PORTAGE Double-Quick, Inc.**

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# Use The STUDER RHU-450 For



- Universal Grinding
- Electronic Size Control
- Match Grinding

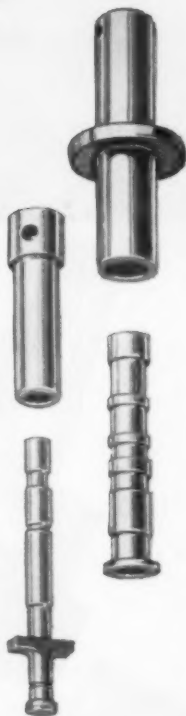
Studer RHU-450 Universal Grinder with electronic equipment.

Special electronic measuring controls on the new Studer RHU-450 Universal Precision Grinder permit extremely fine accuracy and a more versatile range of grinding operations for match grinding, internal and external grinding, superfine and lap grinding.

**MOVOLIMIT** Electronic Size Control, for highly accurate grinding to pre-determined diameter from a master part or the first workpiece in the run. The grinding operation is controlled automatically, independent of grinding wheel wear.

**DELTAIMIT** Match Grinding Instrument, for match grinding a shaft to fit a specific bore diameter. **DELTAIMIT** equipment is ideal for grinding servo valves, plungers and barrels, and other mating parts requiring tolerances in the millionths.

**Other Features**—handles workpieces up to 18" between centers with 8" swing—workspindle speed infinitely variable from 30 to 650 rpm—cylindrical cam grinding attachment—taper grinding attachment.



Electronically mated parts produced on a Studer RHU-450.

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### Clearing Unveils Welded Steel Lathe

CHICAGO—The first lathe to take full advantage of the freedom of design possible with welded-steel was unveiled at the Clearing Division plant of U.S. Industries, Inc., recently.

The new machine, called the Clearing-Axelson Blue Chip Lathe, is built to handle the tougher, high alloy materials. To achieve the rigidity necessary for the greater demands that carbide and ceramic tooling, with their correspondingly higher productivity, impose, this lathe is constructed by welded steel fabrication.

Forty spindle speeds are available up to 2,000 R.P.M. The main motor has 50 H.P.

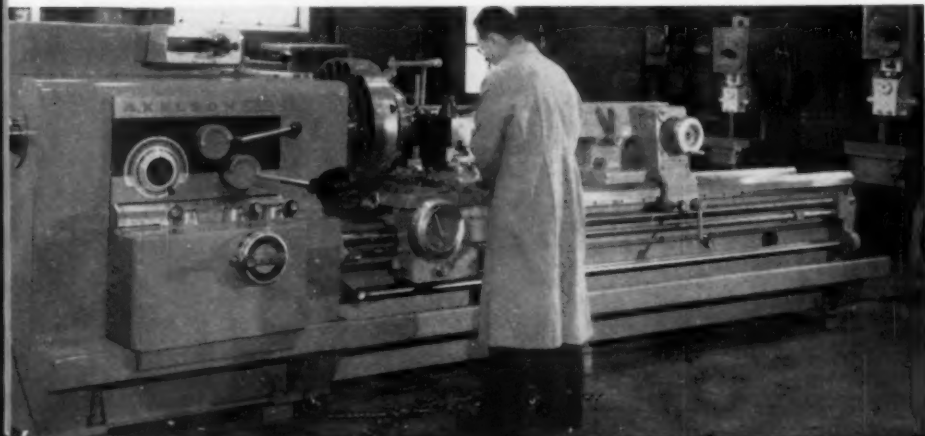
With the headstock built to the

floor, it is a completely independent unit containing the drive and feed units, and the electrical equipment for the machine. It also serves to mount the operating console and other devices. The bed is mounted to the side of the headstock by a thick, extra wide flange.

A future need for greater length bed—or a completely different requirement in the bed—can be met by assembling the existing headstock to the new bed which can be independently designed and built as required.

"Unitizing" has been carried out on every major component of the headstock. Drive gearing, quick

The all new Clearing-Axelson 2516 welded steel, "Blue Chip Lathe."



## Field Reports

*continued*

change gear box, and electricals—each may be removed as a unit to simplify servicing.

The feed gear box is completely enclosed and attaches to the front of the machine complete with hand wheels and levers. All electrical accessories are contained in a common enclosure that mounts in a recess in the headstock.

Forty spindle speed changes at closely spaced intervals are offered in this lathe. A total of 88 carriage feeds and threads are provided in the carriage feed box.

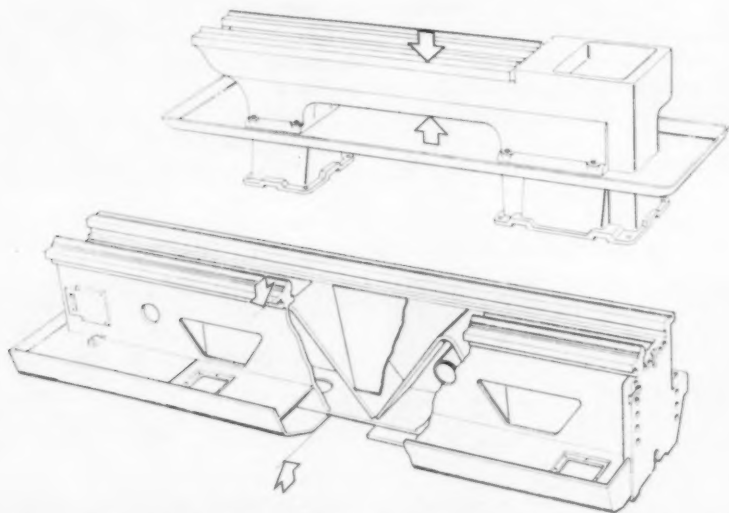
Standard gear shifting on the Blue Chip lathe is manual with a four

position and a five position lever operating in two ranges taking care of all speed changes. However power assisted and full power shifting are available as options.

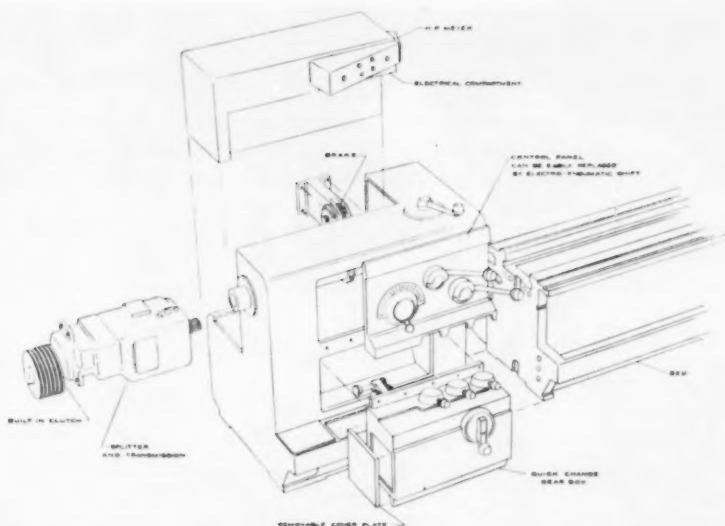
In the Clearing-Axelson, all operating controls can be easily reached by a man standing erect and not moving his feet.

The rotary slide rule picks the right code for speed changing. Moving two levers puts the spindle into that speed. Spindle speed levers are color coded in orange. Feed change levers are color coded in yellow. Feed speed changes are made quickly and easily.

• • •



**Cutaway of Welded Steel Bed.** Top is a conventional bed. Below is the "Blue Chip" Welded bed which has extremely thick, wide flange for rigid mounting to the headstock. Ribs are placed so that they form a series of pyramids to add immense stiffness and for the walls of chip chutes.



**Easy Accessibility.** The unitized design of headstock makes it possible to have easy access to all components. Drive gearing, quick change gear box, and electricals, each may be removed as a unit to simplify servicing.



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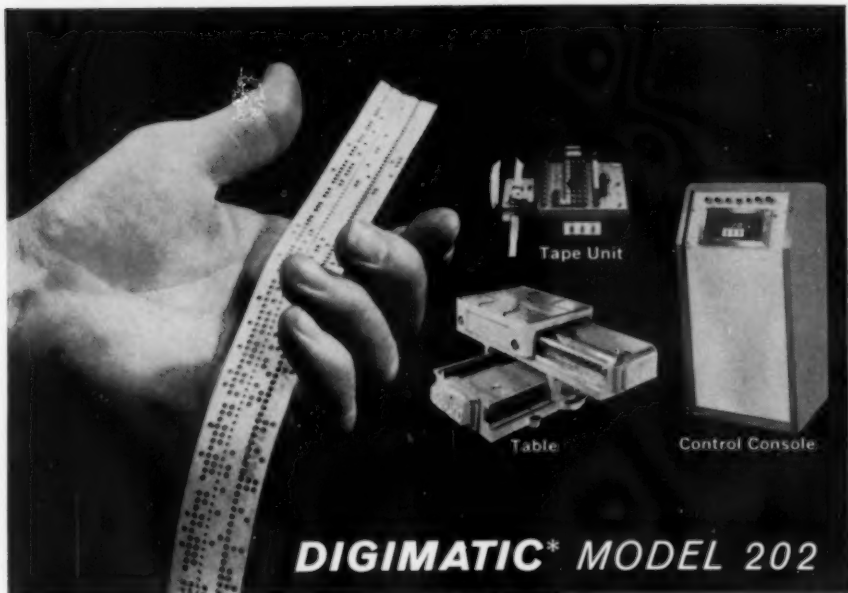
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Using tape controls to cut tooling costs is a fact.

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The DIGIMATIC MODEL 202 Control System includes all equipment necessary for numerical control of point positioning operations.

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## **Tape - Controlled Positioning Table**

*... for heavy duty drilling and boring jobs*

**CINCINNATI**—A new tape-controlled positioning table was coupled with a Hole Wizard radial drill to perform a number of machining operations with accuracies in millionths and at impressive savings in time and tooling costs. The demonstration of the machine's application to heavy-duty production drilling and boring jobs was conducted recently in the Ameri-

can Tool Works Company plant.

Numerically controlled by an endless punched tape, the new 8,000 lb. positioning table can support heavy workpieces, positioning the work anywhere within a 30" x 20" working area with an accuracy of  $\pm .000250$ " (non-accumulative) on either axis, or repeating a position within  $\pm 50$  millionths ( $.000050$ "). And, according to

**New tape-controlled positioning table** capable of accuracy equal to the finest jig borer, developed by The American Tool Works Company, Cincinnati. Shown (l. to r.) are: air pressurized tape control system electronic cabinet; hydraulic system pumping and valving unit; operator's control panel on portable stand; and the heavy duty table assembly incorporating base, saddle and table units.



company engineers, the table has the ability to hold these accuracies even when installed out in the shop.

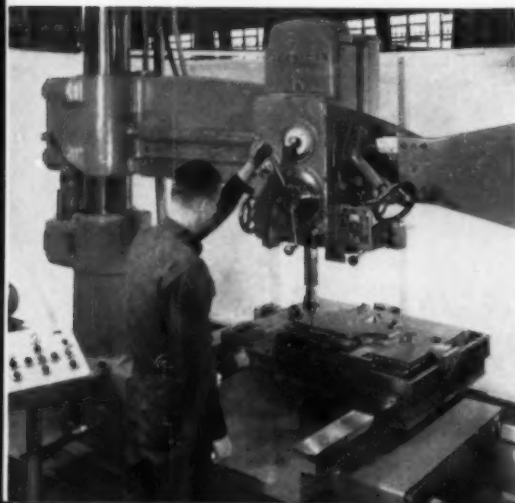
Unlike a jig borer or a spacer table with set stops or dials, the new machine is fast in positioning, and does not depend upon the skill of the operator. The table travels automatically from one position to the next, moving simultaneously on both axes ("x" and "y") at the same speed from start to finish of movement—yet with no over-travel. Actuation is entirely hydraulic, eliminating traversing screws or nuts and their associated back-lash problems, and motors with their inertia problems. Because the hydraulic actuating cylinders are in a balanced closed circuit, the table is rigidly held in position when the pistons are at rest. There are no clamps to produce a shift in table position.

The new tape-controlled table, reports American Tool, is ideally suited for job-lot runs, large or small. With the endless punched tape, as soon as one workpiece is complete the ma-

chine is ready for the next without rethreading of the tape. Intermediate positions on the endless tape cannot be lost, since the hole pattern, once punched, remains in proper relationship for the entire life of the tape which is good for thousands of pieces. The tape's small size also facilitates economical storage.

During operation, the punched tape is read pneumatically by a flow of low pressure air. This air, passing through the holes in the tape, actuates a selected series of switches, signalling the electronic control system where the positioning table is to move (in terms of "x" and "y") to arrive at the next working location. The electronic circuits then actuate the machine's hydraulic system to perform the required travel.

Feed-back signals—which tell the electronic system (product of The Sperry Gyroscope Company) where the table is presently located and announce its arrival at the new position—are supplied by two Farrand



A 30 percent reduction in floor-to-floor time and a \$2,050.00 saving in tool costs compared to drill jig methods, have been achieved in the drilling and spot facing of aluminum gear case covers with this tape-controlled positioning table and Hole Wizard radial drill setup. The positioning table, with a 30" x 20" working area, provides an accuracy of  $\pm .000250$ " on either axis, or can repeat a position within  $\pm 50$  millionths (.000050").

electronic scales; one each on the "x" and "y" coordinates. Each scale is made of glass with embossed wiring, and is read by a slider which maintains a .005" air space away from the scale surface. By virtue of this air gap, wear of any kind is prevented. These electronic scales are located in two hermetically sealed housings.

Each position recorded on the punched tape includes: a) the "x" axis location; b) the "y" axis location; c) special instructions.

The above three items of positioning information are picked up simultaneously by the tape reader. This eliminates the need for a complicated memory device as part of the electronic control circuits. The punched tape does not move ahead to digest information for the next position, but travels only from position to position as the machine work-cycle progresses. This makes it possible by simply pushing two buttons, to repeatedly move out of position and back again when trying a gage into a bore.

During loading of the machine, workpieces are located on the positioning table by means of stop-plates,

installed at the edges of the table. Using blocks of prescribed length between these stop-plates and the workpiece, the operator can easily locate the work without time-consuming juggling or having to depend on trial-and-error techniques. (Block lengths are prescribed by the man who makes the tape.)

In setting up the radial drill originally, the head and arm are locked in proper position by simply tramming with the spindle a hole which has been bored and bushed by the builder in the absolute center of the table.

The table and saddle travel on hardened and ground Timken graphic tool steel ways. Each set of ways comprises one flat way and one vee way. The vee way eliminates the necessity of employing side gibbing with accompanying running-clearance inaccuracies. Although the ways of the machine are practically impervious to wear, they are replaceable in event of accidental damage. The straightness and squareness of the movements have been optically checked to  $\pm .000080$ " with an auto-collimator.

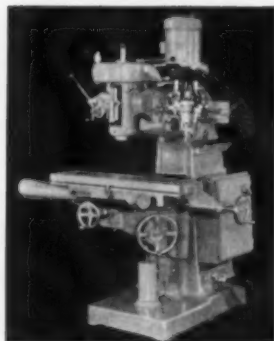
A 7-hour job on a horizontal boring mill, the drilling, boring, counterboring, reaming, tapping and spot facing operations of ductile iron column caps are accomplished in only 1¼ hours floor-to-floor time, with this tape-controlled positioning table and Hole Wizard radial drill at The American Tool Works Company plant, Cincinnati. Best previous time for machining these column caps was 1¼ hours on a radial drill and jig setup. (Jig cost \$3,700.00).





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## GORTON MACHINE TOOLS,

both standard and custom-designed, are to-day \*paying for themselves in record time. Here are just three typical examples:

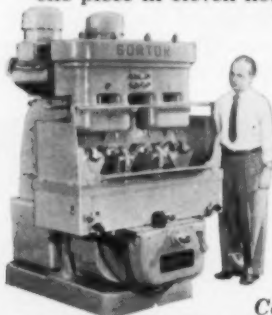
from **8 Hours** per piece  
to **5 Minutes** per piece

This standard Gorton Trace-Master Hydraulic Duplicator was purchased to profile a complex part from a simple master. Previous cost of this operation was \$102.40. Present cost with this Gorton machine is \$1.07. Saving per piece is \$101.33.

\*Cost figures were arrived at by using \$2.80 per hour for operator's time and \$10.00 per hour, machine rate.

cost saving per piece...**\$1,139.20**

This Gorton Horizontal Mill with special holding fixture, tooling, hydraulics, etc., was purchased to machine thirty-five impeller blades from the solid, involving compound curvatures, thicknesses and depths. Former production time was one piece in 100 hours. Present time on this new machine is one piece in eleven hours. Machine was paid for after machining 22 pieces.



**\$50,000** machine pays for  
itself in **41 Weeks**

This Gorton 4-spindle "Automatic Cycle" Duplicator was purchased to mill out recesses in a round steel part. Original production time on a manually operated single spindle duplicator was 60 pieces per hour. Present production on this new machine is 204 pieces per hour. Cost saving is 71%.

*Cost reduction and improved accuracy are important to you today. We shall be glad to analyze your needs and make specific recommendations on request.*



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## Free Literature

MACHINE AND TOOL  
**blue book**



(See Number 1)



(See Number 2)



(See Number 3)

To receive copies of booklets described below, circle their identifying numbers on an Action Card, found opposite pages 64 and 176.

**1. Honing Machine.** Revised bulletin X-Man-5000 states that working range of Sunnen equipment now covers hole diameters from .100" through 2.625" with tooling available from stock; to 4½" with tooling built to order. Sunnen Products Co., Dept. D-20, 7910 Manchester Ave., St. Louis 17, Mo.

**2. Parts & Assemblies,** from massive boiler breechings to smallest stampings, are illustrated in 40-page sheet and plate fabrication catalog. Among components and assemblies shown are: power plant fabrications, electrical enclosures, machine bases, guards, cabinets and boxes, stampings, concrete forms, plating equipment. Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

**3. Screw Conveyor Drives.** Bulletin describes a compact screw conveyor drive complete with speed reducer, packing gland and drive shaft, all of which mount as a unit on a trough end. Expanded line includes four sizes to cover most industrial applications. Each size available in three ratios—18 to 1 or 8 to 1 with double reduction gearing, or 3 to 1 with single reduction gearing. Bulletin A6676, Dodge Mfg. Corp., Mishawaka, Ind.

**4. Measuring Tools and Instruments.** Catalog No. 25 contains 93 profusely illustrated pages outlining Scherr-Tumico inspection and other tools. Descriptions are brief, yet most give sufficient information so that one may order without further quotation. George Scherr Co., Inc., 200 Lafayette St., New York 12, N.Y.

**5. Metals Forming.** Booklet introduces "Hydroforming"—method to form piece parts from blanks up to 19". Claimed to cut tooling costs, save delivery time, make odd shapes practical. Roland Teiner Co., Inc., 134 Tremont St., Everett 49, Mass.

**6. Reamer and Drill Blanks.** Hardened, tempered and ground high speed steel reamer and drill blanks are presented in folder, as well as ground-from-the-solid drills and reamers—plain, carbide tipped, or solid carbide. Ace Drill Corp., Adrian, Mich.

## Free Literature

continued

**7. Tape Control.** Bulletin No. 176 describes a system which is claimed to be extremely simple, can reduce setup and machining time 25%. Filling in the tape data form and all other subsequent operations in preparing the tape take only about 30 minutes; no engineering training is required and no mathematical computations are involved. Potter & Johnston Co., West Hartford, Conn.

**8. Indexable Insert Face Mills** and shell end mills are presented in Catalog 591. They eliminate the need for cutter sections in regrinding. Catalog describes cutters with negative and positive rake angles, square shoulder and 45° lead angles, carbide and high speed steel indexable blades. Viking Tool Co., Nichols Rd., Shelton, Conn.

**9. Materials Handling Equipment.** Loose-leaf catalog covers jib cranes, portable gantry cranes, end trucks (to build your own crane), sheet lifters, grabs, lifting devices. H. L. Bushman Co., Inc., 100 W. Central Ave., Roselle, Ill.

**10. Tilting Rotary Table.** Circular tells about table equipped with an Electrolimit measuring system and special motor drive and gearing to provide a stationary platform—divorced from the earth's rotation—for the calibrating and testing of navi-

gational gyroscopes, such as those used in missile and rocket development. Pratt & Whitney Co., Inc., Charter Oak Blvd., West Hartford 1, Conn.

**11. Tool Supplies.** Broaches, blow guns, clamps, die components, eye bolts, fixture locks, handles and knobs, hand wheels, setup aids are some of many items listed in pocket-size catalog. Reid Tool Supply Co., Delano Ave., Muskegon Heights, Mich.

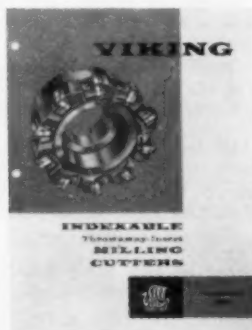
**12. "Perforating, Slitting and Blanking"** discusses suggested applications, materials, how to specify, and illustrates many patterns, giving detailed specifications. Perforating Industries, Inc., 153 W. Westfield Ave., Roselle Pk., N.J.

**13. Automation.** Catalog outlines the manufacturer's services for automation equipment, components, standard and special machines for metalworking industries. Included in catalog is a useful full page chart for anyone interested in metal cutting. It shows such things as drilling feeds, speed, hp required. Michigan Special Machine Co., 11449 Timken Ave., Warren, Mich.

**14. "Avoidable Costs Replacement Formula"** is a practical aid for management and production executives who are concerned with machine tool and capital equipment replacement. The booklet reveals the limitations and downright fallacies that exist in many commonly used replacement formulas. Jones & Lamson Machine Co., Springfield, Vt.



(See Number 7)



(See Number 8)



(See Number 9)

This is a  
knock-out cavity bushing.



It is used in plastic injection  
molding.



It is manufactured by *FASTEX*,

Division of Illinois Tool Works, Des Plaines, Illinois.

It has a  $7^{\circ}30'$  internal taper.

It is ground from hardened  
tool steel, 58-60 Rockwell C

The tolerances must be held to

0.0002"



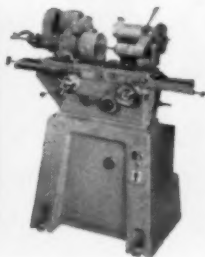
The grinder on which this bushing  
and all its cousins are made is a



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are 3" diameters,  
depth 4". Collets and  
step chucks mount  
directly in lathe-type  
spindle.

## Free Literature

continued

**15. Flexible Shaft Machines** with gear box have 5 to 7 speeds and are adaptable to all jobs requiring frequent speed changes. Types R-Quint and R-Mammoth are particularly well suited for handling any job involving milling, filing, and polishing. Folder available from American Rotary Tools Co., Inc., 44 Whitehall St., New York 4, N.Y.

**16. Dust Collector.** Product bulletin describing the Type D Roto-Clone dust collector provides complete information about its application, principle, design, construction, operation, installation and arrangements. American Air Filter Co., Inc., 215 Central Ave., Louisville, Ky.

**17. "Cemented Carbides for Industry"** has been revised to include information on brazed tools, carbide inserts, tool holders, and blanks. It also announces reduced prices on practically all steel cutting grades. Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.

**18. Wheel Dressers.** Fluidmotion dressers dress two angles tangent to a radius in one continuous motion with .0001" accuracy. Folder contains diagrams and specifications. J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N.J.

**19. Screw or Pin Driving Machines.** The Russell Auto-Feed magazine screwdriver stores, feeds and drives screws automatically. It will drive screws which are uniformly accurate—any type, sizes from No. 0 (1/16" dia.) to No. 14 (1/4" + dia.) and in lengths from 3/32" up. H & G Sales Corp., 150 Truman St., New Haven 6, Conn.

**20. Surface Grinder.** A new saddle control for the Taft-Peirce No. 1 precision grinder is the subject of Bulletin No. MT-003. Changes which have been made to increase the versatility of the machine: Flat steel pedestal ways have been replaced by roller ways; a special anti-backlash crossfeed screw and nut assembly has been designed, and protective dust-guards have been incorporated between table and saddle. Taft-Peirce Mfg. Co., Woonsocket, R.I.

**21. Expanding Collet,** claimed to make inside chucking easy, accurate and economical, is subject of flyer. Needs no special attachments, no adaptors. Permits truing cuts, shoulder cuts. Conventional draw bar movement does the expanding and releasing with the spindle in motion. Dunham Tool Co., Inc., Danbury R4, Conn.

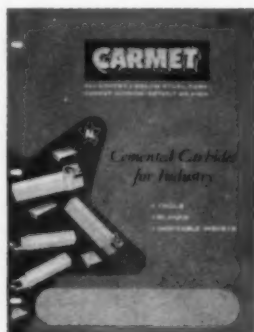
**22. Radii Finishing Tool.** For metal, wood or plastic, this portable radii finishing hand tool is said to do jobs in minutes that ordinarily take hours of hand finishing on protruding radii and convex surfaces. Adapts to most air grinder motors. Flyer available from Peterson Tool and Mfg. Corp., P. O. Box 513, Okemos, Mich.



(See Number 15)

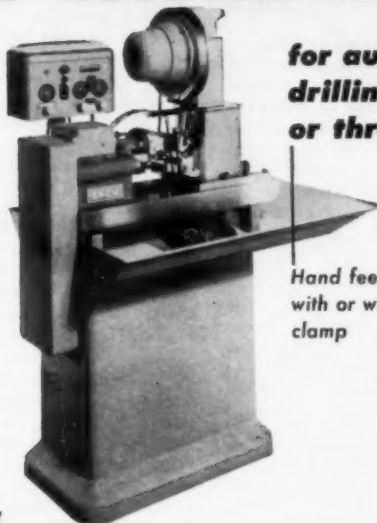


(See Number 16)



(See Number 17)

# NOW AVAILABLE...



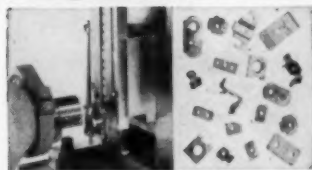
**for automatic  
drilling, tapping  
or threading**

Hand feed or hopper feed  
with or without air-operated  
clamp

## NOW...drill rivets faster with minimum tooling costs



Drills 500-3600 per hour;  
hopper feed; air-operated  
clamping. Capacity #74  
(.0225") to  $\frac{1}{4}$ " in mild steel.



Taps 4000 per hour  
hand feed magazine.  
Capacity #0 to  $\frac{1}{2}$ " fine  
pitch in mild steel.

A new horizontal version of the same operating principles long used in Snow vertical machines. Snow machines reduce changeover time, and cut tooling costs to a ridiculous minimum. On your next job, let us show you what the Snow method can do. Submit samples and prints.

Snow Manufacturing Company, Dept. B, 435 Eastern Avenue,  
Bellwood, Illinois (Suburb of Chicago)

# SNOW

*master fixtures save dollars and days in tooling costs*

Use postpaid card. Circle No. 305

## Free Literature

continued

**23. Punch Presses.** For increased production of stampings using modern controls, Electro-Safe punch presses offer positive, double trip safe; effective use of malfeeding or overload detectors; auxiliary equipment readily synchronized to press controls; elimination of stored energy hazards; simple positive single stroking; instant cycle selection. Folder from Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif.

**24. Press Brakes.** Bulletin No. D-59 illustrates and describes in detail the features of Chicago Series D mechanical press brakes. Gives complete specifications of the 40 standard sizes in this series (capacities from 90 to 500 tons). Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill.

**25. Hydraulic Tracer Mills.** Folder describes the great variety of work that can be performed on Famco True Trace. Simplifies the production of die, mold, and cavity work of all kinds. Recommended for short production runs because of ease of setup. Famco Machine Co., Kenosha, Wis.

**26. "Extendrill"** is a combination of extension rod and interchangeable collets. Tool may be used for both machine and hand drilling. It solves remote-spot drilling problems. Flyer from Ritmar Corp., 183 New York Ave., Huntington, N.Y.

**27. Rust Prevention.** Brochure presents basic information on rust, its causes, and application of preventives. Included is factual data on the various types of Rust-Lick rust preventing liquids, their recommended applications. Rust-Lick, Inc., 755 Boylston St., Boston 16, Mass.

**28. Flexible Shaft Machines,** designed especially for small work industrial grinding, finishing and deburring, are presented in folder. The slim 7D handpiece can be handled with the sensitivity and control of a fountain pen for fine artistic work. The heavier duty Nos. 30 and 44 handpieces can be used for routing and grinding of large areas and tough materials. Foredom Electric Co., Inc., Bethel, Conn.

**29. Carbide-tipped Saws and Cutters.** Improved design makes possible longer life between grinds. Made in a variety of widths and contours to customers' specifications. For use on shapers, molders, and tenoners for rabbeting, edging or grooving. Booklet from Lemmon and Snoop, 2618 Thornwood St., S.W., Grand Rapids, Mich.

**30. Tracing Attachment.** Bulletin No. STM-1 describes the cost saving features of Synchro-Trace, the new fully automatic 3D programmed control system for milling applications. Longer tool life, due to the even loads being placed on the cutter. True-Trace Sales Corp., 9830 Rush St., El Monte, Calif.



(See Number 23)



(See Number 24)



(See Number 25)

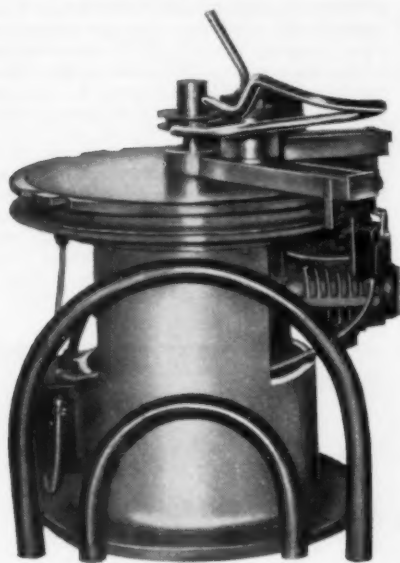


# tricky

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Complicated pipe, tube or structural metal bends are a cinch with Pedrick Production Benders—on either a production or job basis.

Show us your problem—with drawings, if possible—and we'll show you the answer. Write PEDRICK TOOL AND MACHINE Co., 3640 N. Lawrence St., Phila. 40, Pa. Dept. 3.



FREE "PEDRICK LINE" BULLETIN.  
WRITE TODAY.

**PEDRICK**

**production benders**

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## Free Literature

continued

**31. Grinding Gages.** Three new gages are featured in catalog covering complete line of Arnold continuous grinding gages: miniature o.d. grinding gage for diameters below a half-inch; king-size o.d. gage for diameters over twenty inches, and a gage for continuously measuring inside diameters while grinding. Federal Products Corp., 1144 Eddy St., Providence 1, R.I.

**32. Balancing Machines.** Eliminating vibration from miniature high speed rotating parts, or assemblies containing high speed rotating parts, is being accomplished with a new line of high speed bench type balancers. Unbalances causing work support movements greater than 0.000002", with the work rotating at any speed between 1000 and 3000 or between 4000 and 12,000 rpm, can be quickly and accurately measured and located. Colorful catalog from Gisholt Machine Co., Madison 10, Wis.

**33. Component Parts** for jigs and fixtures and over 250 clamping items are covered in catalog. Full scale tracing templates of the jig and fixture components are included. Northwestern Tools, Inc., 118 Hollier Ave., Dayton 3, Ohio.

**34. Precision Measuring Instruments.** Micrometers, vernier calipers, straight edges, scribing tools, set squares, spirit

levels, test indicators, dial indicator gages, electric comparators, bore measuring instruments are among instruments described and illustrated in catalog. Mahr Gage Co., Inc., 274 Lafayette St., New York 12, N.Y.

**35. Angle Attachments** for power hand tools which permit "around the corner" precision drilling, burring, rotary filing, grinding, polishing, high speed nut setting and screw driving at 45° angles are described in catalog. Drexler Div., Monument Engineering Co., 1625 Bellefontaine St., Indianapolis, Ind.

**36. Lead Screw Tapping Unit.** Circular contains specifications, operating instructions, plus list of available accessories. Push button feature permits operator to use this unit in six different ways. It taps uniform gage fits in pitches from 20 to 96. Proconier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

**37. Work Standards and Control.** Brochure shows why, how and the advantages of measuring the work input of the machine, which does 99% of the work, rather than the operator, who performs only 1%. Stewart Instrument Co., 6507 Grand River Ave., Detroit 8, Mich.

**38. Aluminum Bronze Extruded Alloys.** Folder introduces Wearite Alloys 4-11 and 4-13. Included are such items as typical chemical composition, mechanical and physical properties, and applications. Peninsular Steel Co., 24401 Groesbeck Hwy., P.O. Box 3853, Detroit 5, Mich.



(See Number 31)



(See Number 32)



(See Number 33)

# KALAMAZOO

## METAL CUTTING BAND SAW MACHINES

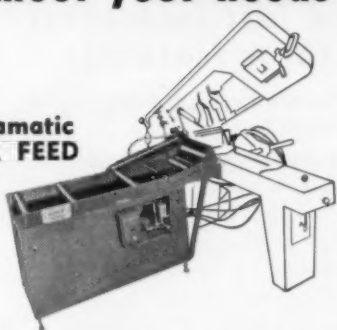
...there's a model to meet your needs



**Kalamazoo  
MODEL 8C**

An all new design, first to meet today's metal cutting needs. Embodies years of *Kalamazoo* experience and the best industrial design talent. Cuts 8" round, 16" flat, 8" pipe. Available with or without coolant equipment.

**Kalamatic  
BAR FEED**



An automatic bar feed attachment for Models 8C, 816, 824 and 1220 *Kalamazoo* Metal Cutting Band Saws. A completely hydraulic self-contained unit which automatically feeds rounds, flats, square, hex, pipe, tubing, etc., any length from 1/4" to 30", or longer.



**Kalamazoo  
MODEL 1220**

Where heavy-duty cutting is a problem, you'll find this rugged saw easy to use. Cuts 12" round, 20" flat. Available with or without coolant equipment.



**Kalamazoo  
MODEL 610**

Here's a low-cost saw that heating, plumbing and electrical contractors go for! Easy to move around in the shop or take along to the job. Cuts 6" round and 10" flat. Available with or without coolant equipment.

It will pay you to investigate KALAMAZOO. Ask your dealer for a demonstration or write for descriptive literature and name of your nearest dealer.

**MACHINE TOOL DIV. *Kalamazoo* TANK and SILO CO.**

**3591 HARRISON STREET • KALAMAZOO, MICH.**

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# NEW *from* GRAND RAPIDS

*and just look at all these features:*

- Powered vertical movement of wheel head\*
- Instantly variable hydraulic table speed
- Greased-for-life precision ball bearing spindle with two speeds for long wheel life
- Head carried on protected pre-loaded ball bearing ways
- Equipped with Vickers vane type pump and our own control valve for infinite longitudinal table speeds from 5" to 120' per minute
- Variable speeds hydraulic cross feed and continuous cross feed
- Rugged, one-piece casting column and base for permanent rigid alignment
- Ultimate in accuracy with micro inch finish at production speeds

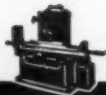
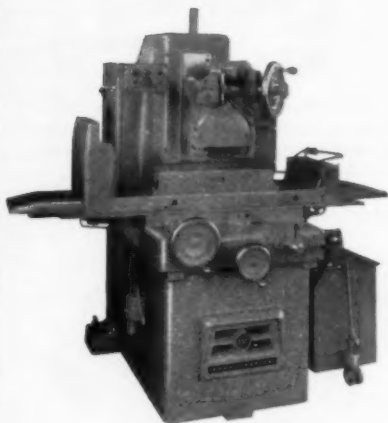
\*Automatic downfeed available as optional feature



For full details, just send a note on your letterhead.

**GALLMEYER & LIVINGSTON CO.**  
405 Straight Ave., S.W., Grand Rapids, Mich.

**No. 350 PRECISION  
TOOL ROOM TYPE  
HYDRAULIC FEED  
SURFACE GRINDER**



**GALLMEYER  
& LIVINGSTON**

Use postpaid card, Circle No. 303

### Scoville Opens New Tube Mill in Connecticut

Completion of Scoville Manufacturing Company's new \$10 million tube mill represents the firm's latest step in a long-range expansion and modernization program. This plant provides facilities to extend their tube line to include copper tube and pipe for plumbing, heating and air conditioning applications.

Unitized mill layout affords streamlined tube processing, with the annealing operation as the central point and with pickling, pointing, drawing operations revolving around it. Conveyor handling of tube is used where practical to reduce overhead crane work as much as possible. Twin reversible type bay-transfer conveyors transfer up to 50,000 lb of tube at a time in either direction.

One of the longest multiple position (five at a time) drawbenches is capable of drawing up to 200 ft of copper tube in straight lengths. Tube elevators at two of the drawbenches substantially reduce need for crane service.

Batteries of stainless steel cleaning (pickling) tanks utilize turbulent forced circulation of acid solution and water to clean both inside and outside tube surfaces simultaneously.

An advanced type of 100-ft-long automatic tube tester for testing two heat exchanger tubes hydrostatically and two pneumatically at the same time is believed to be the longest tester of its type in the industry.



### B&S Cutter Service Co. Opens in Michigan

The cutting tool division of Brown & Sharpe Mfg. Co. has announced the opening of another cutter service company. It is located in the Double A Valve plant of the Hydraulics Div., East Duncan St., Manchester, Mich.

Brown & Sharpe distributors now offer service on resharpener or modification of cutters and end mills. This service is said to provide original cutting efficiency to both carbide and high speed cutters.

### M&M Enters Agreement with German Manufacturer

The Motch & Merryweather Machinery Co., Cleveland, has announced that its manufacturing division has entered into a manufacturing agreement with Heller Brothers, of Nuertingen, Germany. This arrangement is expected to provide for the interchange of engineering data and technical information that will assist Motch & Merryweather in its research and product development.

Heller, one of Europe's largest machine tool companies, has been successful in the development of the building block principle of machine tool design.

### Mahr Showroom Opened

A U.S. distribution center has been established by the firm of Carl Mahr, Esslingen, Germany, for the sale and service of its precision measuring instruments and tools. The Mahr Gage Co., Inc., 274 Lafayette St., New York 12, N.Y., has been appointed sole distributor for the parent company and will confine its sales to Mahr products exclusively. A repair and parts service

will also be maintained.

Mahr items include: indicating micrometers; electric precision comparators and indicating instruments; comparator gaging heads; dial indicator comparators; self-centering bore measuring instruments; high speed thread measuring instruments; dull chrome finished vernier calipers; micrometers, and other precision measuring instruments.

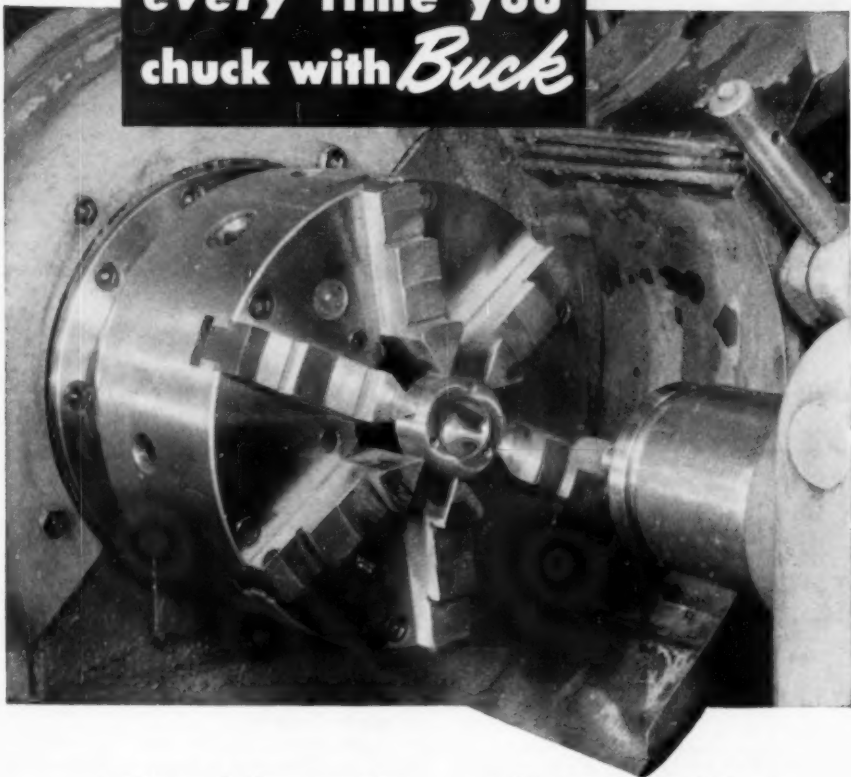
## SAVE 50% or more in CONTOUR GRINDING COSTS with Micromaster



Sold by  
**Brown &  
Sharpe  
Mfg. Co.**  
Providence,  
Rhode Island

Visual Grind is manufactured by  
**The CLEVELAND GRINDING MACHINE Co.**  
1670 EDDY ROAD • CLEVELAND 12, OHIO  
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**YOU make money  
every time you  
chuck with *Buck***



1. You get *dead true* precision chucking single parts—.0005" precision on duplicate parts. (Conventional chucks are only accurate to .003" *when new*.)

2. You save costly machinists' time. Takes but a minute to indicate and adjust a Buck. No fooling around with shims.

3. The Buck Adjust-Tru® principle helps compensate for spindle run-out, compensates for chuck wear—greatly lengthens chuck life.

Buck Adjust-Tru 3- and 6-jaw chucks cost no more than conventional chucks. Send for catalog—see for yourself why "It pays to chuck with Buck."

Makers of Scroll, Power,  
Dust Proof, Independent  
Chucks.

**BUCK TOOL COMPANY**

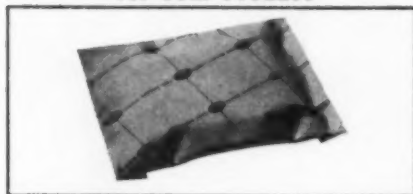
612 SCHIPPERS LANE • KALAMAZOO, MICH.

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## JIFFY PADDED SHIPPING BAGS for Your Product



- ➔ **SPEED**—Nine seconds is all it takes to pack a product for shipment. Insert item—staple or tape. It's ready to go!
- ➔ **PROTECTION**—Thickly cushioned, inexpensive Jiffy Bag is all the protection your product needs. It takes the place of boxes, fillers, overwraps.
- ➔ **ECONOMY**—You can save up to 76% packing time by switching to JIFFY BAGS. Eliminate overtime. Meet delivery schedules with money-saving, time-saving JIFFY BAGS.

Write today for samples and prices.

### JIFFY MANUFACTURING CO.

376 FLORENCE AVE., HILLSIDE, N. J.

Use postpaid card. Circle No. 311

## Madison Faessler Division Moves to Home Office

In a move to consolidate all their divisions into one central plant, Madison Industries, Inc., has relocated their Madison Faessler Division, Moberly, Mo., to the Madison Industries' home office and plant at Providence, R.I. This Division will continue to manufacture roller burnishing tools and repressing tools.

The shift was the final step in a centralizing program which last year integrated the Madison plant in Muskegon, Mich., into the Providence operation. In both relocation projects, key design and manufacturing personnel were transplanted intact from their previous locations.

## W&S Joins English Firm

The Warner & Swasey Co., Cleveland, and Asquith Machine Tool Corp. Ltd., Halifax, England, are jointly forming a new company, to be located in Halifax, for the manufacture of the Warner & Swasey line of single spindle automatics for United Kingdom, European and other world markets. This was recently announced by Walter K. Bailey, president of Warner & Swasey, and Robert W. Asquith, chairman of Asquith. Articles of Association for the new company, to be called Warner Swasey Asquith Limited, have been filed in London.

"This move," Bailey said, "will enable Warner & Swasey to tap foreign markets

## DANNEMAN *Precision* DIE SETS



Precision  
bored on  
master  
plates

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Acme-Danneman Company, Inc.

203 Lafayette St., New York 12 • AL 5-7150

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MACHINE and TOOL BLUE BOOK

from which we have been practically excluded because of the advantages enjoyed by foreign competition. . . . By building [W&S automatics] also in England, within the Sterling area, production costs will be comparable to those of foreign builders."

The machines will be built by Asquith, at the outset in its present Halifax plant and later in separate facilities to be provided by Asquith. This firm, founded in 1865, is one of England's large machine tool companies, making

drilling machines, boring machines, certain types of lathes, and special machinery, none of which is competitive with Warner & Swasey products.

"This new arrangement," Bailey concluded, "should have no effect upon employment in our plants, since it does not remove production from the United States. It will simply enable us to sell in foreign markets machines which we have not been able to sell when built in this country."

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TOOLS FOR  
PRODUCTION, TOOLING, MAINTENANCE



Drill press vises, angle vises, swivel machine vises, rotary tables, lathe milling attachments, production vises, heavy duty angle vises, and adjustable angle plates are illustrated and fully described in the New Palmgren Catalog. This is the only complete line of work holding devices available anywhere. Designed for production, tooling, and maintenance work, there are 68 different models and types to choose from. Vise jaw sizes are from 1½" to 8". Ask for your copy of this FREE Catalog No. 205 today. The complete line with details and prices are shown.

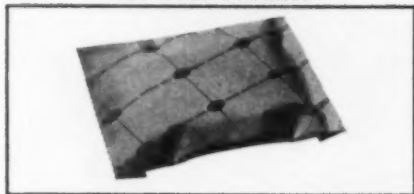
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## **DANNEMAN** *Precision* **DIE SETS**



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**ON  
WORK HOLDING  
TOOLS FOR  
PRODUCTION, TOOLING, MAINTENANCE**

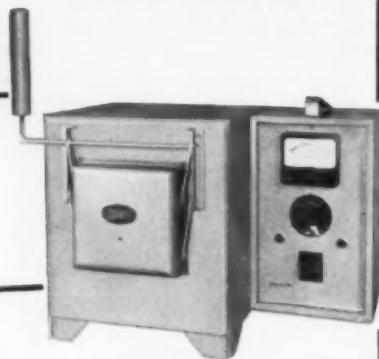


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**PALMGREN PRODUCTS**  
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## "Do-It-Yourself" Saves Hours Cuts Costs



Why let someone else set your production schedules? If you now depend on outside heat treat sources, consider all the advantages of heat treating tools, dies, parts, etc., right in your own shop with a versatile TEMCO electric furnace. No bother with time-wasting pickup and delivery of work...no downtime while waiting for it to come back. Saves hours on jobs. Cuts costs...for TEMCO furnaces are economical to own and operate. Easy to hook up...easy to use. (Shown above is Type 1600 with TEMCOMETER-type controls in new cabinet assembly.) The TEMCO line includes eighteen models with chamber sizes from 4" x 3 3/4" x 4 1/4" to 10" x 9 1/2" x 22". \$72.50 to \$1200.00 complete with controls. Write for TEMCO-THERMOLYNE catalog information and nearest dealer's name.



**ELECTRIC FURNACES**  
Thermo Electric Manufacturing Co.  
486 Huff St., Dubuque, Iowa

Use postpaid card. Circle No. 314

## NSMPA Plans 3rd Conference

The National Screw Machine Products Association has announced its third biennial sales conference for member company sales personnel. The conference is scheduled for Cleveland's Wade Park Manor Hotel, August 19 and 20.

"This year's meetings," according to Conference Committee Chairman Joseph Stevens, sales manager of the forging and screw machine division of the Scovill Mfg. Co., "are designed to help make the screw machine products salesman an indispensable liaison between his company and the purchasing agent or design engineer in his customer's plant. It has long been the Association's axiom that the valued salesman is one who serves not as an order taker, but as a source for that kind of information that will enable the customer to specify a better part, and often at a lower price."

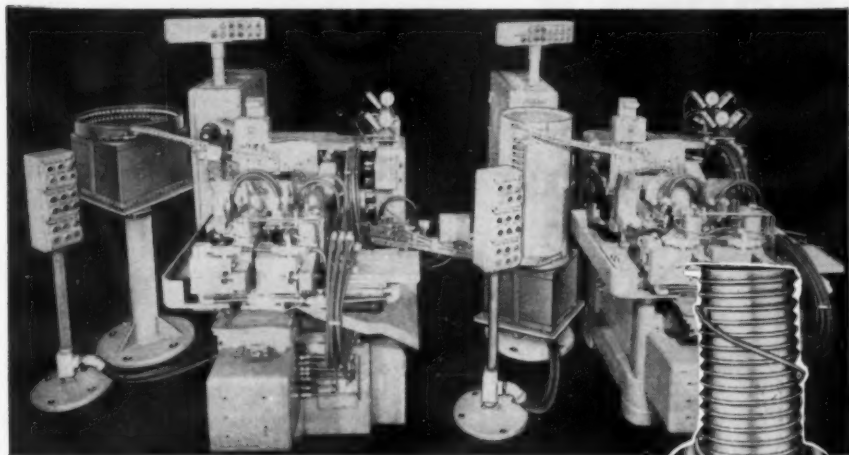
The 1959 conference will include talks by Dr. G. Herbert True, director of creativity research, Visual Research Inc; Fred Smith, head of his own business brokerage and management consultant firm; Erwin K. Taylor, president,



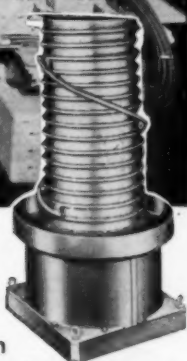
# SYNTRON

Transfer & Storage

## PARTS FEEDERS



**Cut costs—increase production  
reduce manual inter-process  
parts handling**



SYNTRON Transfer & Storage Parts Feeders provide an automatic link between process operations. They automatically receive, store, orient and discharge parts at a controlled rate from one operation to another. Parts may be received at one level and discharged at another—conveyed either up or down spiral as desired. Rate of parts flow is instantly controllable to operational demands.

Simplicity of design—working on an electromagnetic principle eliminating mechanical wearing parts means dependability and low maintenance.

Reduce costs—increase production, eliminate tote box storage and manual parts handling, save floor space with SYNTRON Transfer & Storage Parts Feeders.

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# The TOOL MAKER'S TOOL— EM 5/8" DRILL PRESS



FLOOR MODEL



BENCH MODEL

features

**INSTANT  
SPEED  
CONTROL**

**BUILT-IN  
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LOW SPEEDS

**PRECISION  
SPINDLE**

Designed and engineered for tool room and precision use. Accurate mounting of head and column insures squareness of spindle to table. Heavy construction. Convenient direct reading variable spindle speed control.

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**THE ELECTRO-MECHANO CO.**  
263 E. ERIE STREET MILWAUKEE 2, WIS.

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Personnel Research and Development Corp., and A. M. Kennedy, Jr., general manager purchases and traffic, Westinghouse Electric Corp.

A highlight of the sessions will be an analysis of screw machine product salesmen's opinions of their jobs, their principals, their customers, and themselves. The report will be given by Robert B. Ross, sales service editor, Dartnell Corp., whose company is making a pre-conference survey of member company salesmen.

## Esbec Moves to New Plant

Esbec Barrel Finishing Corp., manufacturer of barrel finishing equipment, media and compounds, has moved to a new plant at Stamford, Conn. It is located at 190 Henry St., Bldg. 16.

According to Morris S. Shipley, Esbec's president, the move was dictated by a need for additional space to accommodate the company's continued expansion in all phases of its activities. All administrative, engineering, production and testing operations—previously divided between Meriden and Byram, Conn.—will now be consolidated under one roof.

The Esbec Finishing Division—providing custom barrel finishing service to industry—will continue to operate at Meriden, Conn.

## Henry B. Austin

Henry B. Austin, vice-president-sales of Armstrong Bros. Tool Co., Chicago, died February 26 at Colorado Springs, Colo. Mr. Austin, who was 61 years of age, was stricken while attending the annual meeting of the Rocky Mountain Association of Distributors held February 2-3 at the Broadmoor Hotel, Colorado Springs.

Mr. Austin joined Armstrong Bros. in 1933 as Eastern sales manager. He and his family moved to Chicago in 1942, when he was made sales manager of the company. In 1954 he was appointed to his terminal position.

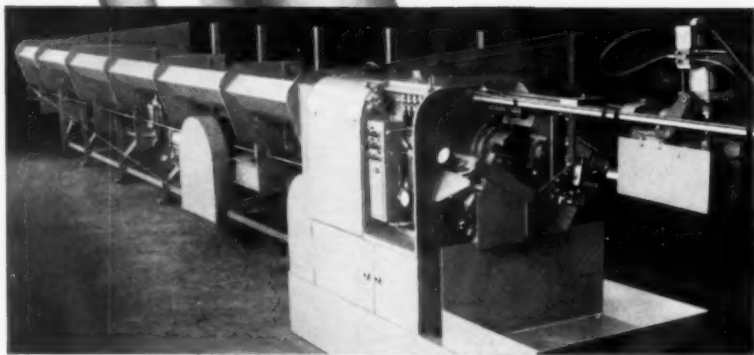




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## Fast CUTTING-OFF of TUBING and BAR STOCK

Automatic operation—  
from loading to final cut-  
off. Handles tubing up to  
8" O.D. Very fast. With  
special tools, parts being  
cut off may be formed,  
grooved, flanged or  
chamfered in a single  
operation—at a high rate  
of speed.



### WRITE for CATALOG

New catalog describes all models—gives  
production figures. Mailed on request.

# MODERN MACHINE TOOL CO.

2005 Losey, Jackson, Michigan

The **HEAVY WEB**

and **FASTER SPIRAL**

of  
**COGSDILL**

**MERCURY SERIES**

**TWIST DRILLS**  
give your customers  
the  
**HIGH PRODUCTION**  
they  
**NEED and EXPECT**  
in  
**TOUGH MATERIALS**

Available in Jobbers Length  
Taper Length  
Straight Shank  
Taper Shank

Does your drill line measure up?  
Better get the Cogsdill Story now!



**COGSDILL TWIST DRILL CO., INC., Greenfield, Massachusetts**

Stocking Warehouses: Detroit, Los Angeles, Greenfield

Cogsdill — the name to remember for quality . . . to watch for progress

Use postpaid card, Circle No. 318

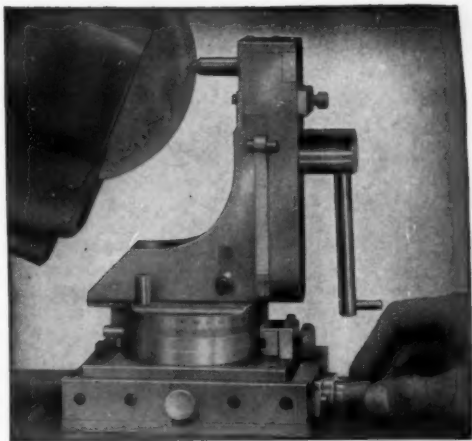
# Tough Grinding Wheel Forms Dressed Easy as A, B, C

eliminate elaborate set-ups  
and operations

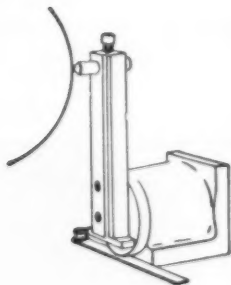
**.0001" ACCURACY**

## *Fluidmotion* **WHEEL DRESSERS**

dress two angles tangent to a radius  
in one continuous motion



With the unique "Fluidmotion" Dresser, you can dress two angles tangent to a radius — using one handle in one continuous motion. Operation is so fast and simple that beginners can use them.



Adaptable to all type cylindrical and surface grinders.

- A. Obtain micrometer reading; add required convex radius or subtract required concave radius.
- B. Loosen jib with wrench and "mike" over lower pins to reading obtained above.
- C. Tighten jib. Set stops for two angles. Ready for action.

Also available: "FORM MASTER" Dresser, capable of dressing any radii up to 12" convex, up to 15" concave.

See your Industrial distributor or write for free literature.



**J & S TOOL CO., INC.**

**CLAMPCUT**

880 DORSA AVE.  
LIVINGSTON, NEW JERSEY

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## Appointments and Promotions

### Personnel Changes . . . Executive and Production



F. L. Chapman



L. S. Hilton

**Fred L. Chapman**, after 30 years with the Gisholt Machine Co., Madison, Wis., has retired from his positions as vice-president in charge of sales and as a member of the board of directors.

**Harvey A. Waddell**, treasurer of the company since 1952, has received the added distinction of being elected secretary and made a member of the board of directors. . . . **Frank J. Vlasaty** has been appointed director of research engineering of Size Control Co., a Div. of American Gage & Machine Co., Chicago . . . **L. S. Hilton** has been appointed manager of the abrasive and diamond wheel departments of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N.J. He succeeds **J. A. Lange**, who requested to be relieved of managerial responsibilities in order to devote his time to improving methods and quality. **C. Fleming, Jr.** has been appointed production and development manager.



H. A. Waddell



F. J. Vlasaty

### Personnel Changes . . . Sales and Service



R. D. Ferris

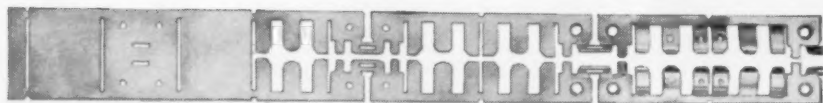
**Robert D. Ferris** has been appointed marketing manager of Ace Drill Bushing Co. Inc., Los Angeles. He was formerly employed as regional sales manager. . . . **Charles Snyder** is now general sales manager of the Stone Machinery Co., Inc., Manlius, N.Y. . . . **John S. Roller** has been named vice-president, sales of the steel division at Firth Sterling, Inc., Pittsburgh, Pa. . . . **Norman C. Hanson**, formerly located at Buffalo with J. H. Williams & Co., has been transferred to the Chicago office as Midwest sales representative. . . . **Charles M. Conover** has been named field engineer for Geo. T. Schmidt, Inc., Chicago. His headquarters will be in Philadelphia.



N. C. Hanson



MANUFACTURER:  
Harvey Hubbell, Inc., Bridgeport, Connecticut.  
PRODUCT:  
Contact Spring.  
PRODUCTION:  
136 Parts Per Minute.



*Blanking, Piercing and Preforming in Press*



*Cutoff*



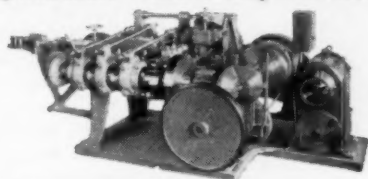
*Partial Forming with Slides*



*Final Forming with Slides*



*Nilson 4-Slide Machine  
with Built-in Press*



## **NILSON 4-SLIDE BLANKS *and* FORMS IN ONE CYCLE!**

Harvey Hubbell shifted production of this part from a conventional press and progressive dies to a Nilson 4-Slide with built-in press. The immediate results: elimination of two secondary operations... simpler die... higher production rate... no stripping problems.

Harvey Hubbell also found that vertical mounting of die makes replacement easy... permits automatic disposal of scrap by gravity. And maintenance costs are incred-

ibly low—this machine has been operating for twelve years without major repairs!

Nilson builds 7 models of ribbon metal forming machines, with built-in press sections ranging from 5 to 75 tons capacity. One of these machines may help you bring your stamping methods up-to-date!

**Write today for the Nilson General Catalog on Automatic 4-Slide Equipment.**



**NILSON**  
THE A. H. NILSON MACHINE CO.

**602 Bridgeport Avenue • Shelton, Conn.**

**AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT**

Use postpaid card. Circle No. 329

## Personnel Changes . . . Sales and Service



K. A. Henn



D. F. Richards



W. E. Staveley



P. T. Wickham

**Kenneth A. Henn** has assumed the duties of a newly created position at Jones & Lamson Machine Co., Springfield, Vt.—that of domestic sales manager. He was formerly manager of the Detroit office, a position that has been filled by **Lewis Bernardini**. . . . **Donald O'Reilly** has been appointed sales manager of the Machine Tool & Attachment Subsidiary of the Jarvis Corp., Middletown, Conn. . . . **William H. Mann**, formerly sales manager of the Electric Valve Div. of the Skinner Chuck Co., New Britain, Conn., has been appointed manager of their newly formed advertising department. . . . Four new salesmen have been added to the staff of the L. S. Starrett Co., Athol, Mass. **D. F. Richards** will serve in the Cleveland territory; **W. E. Gillis** will be located at the Los Angeles branch; **W. E. Staveley** moves to Atlanta, Ga., and **P. T. Wickham** will locate in the western New England territory. . . . **Arnold N. Hellewell** has been appointed sales director for turret drilling machines at Brown & Sharpe Mfg. Co., Providence, R. I. He was formerly located in the Ohio territory. . . . **Robert V. Merrell** has been named general sales manager of Atkins Saw Div., Borg-Warner Corp., Indianapolis, Ind. . . . The Harris Refrigeration Co., Cambridge, Mass., has appointed **Roland Jamison** sales manager. . . . **John R. Keates** has been elected vice-president, sales of National Automatic Tool Co., Inc., Richmond, Ind. . . . Executive sales appointments at the Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N.J., are **S. R. Delaney**, sales manager, and **A. J. Verrinder**, assistant sales manager. Technical superintendents also appointed are **D. B. Bell** and **L. A. Benson**. **T. Gordon**, formerly superintendent of the diamond wheel dept., has been appointed field engineer for diamond wheel sales to replace **H. Ahlers**, who is retiring.



Donald O'Reilly



W. H. Mann



W. E. Gillis



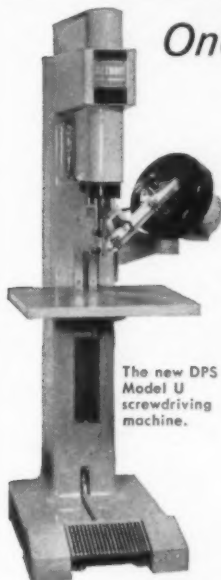
J. R. Keates

How  
many ➡

Screws are  
#8—32 x 1/2 inch long.



what's  
your  
guess?



The new DPS  
Model U  
screwdriving  
machine.



*One man can drive them in  
one hour with a **DPS**  
**power screwdriving  
machine***

Why sacrifice manpower on so simple yet tedious a job as driving screws? Free skilled hands for more productive work . . . get higher output per happier manhour—with a DPS power screwdriving machine.

To illustrate, one worker can drive the 2,400 screws in the jar above in one hour. And with no more effort than pressing an air-operated foot pedal. Equally important, they're driven through an easily adjustable clutch, designed to hold constant driving torques.

**NEW! THE MODEL "U"** — At left, meet the great, new DPS Model "U" screwdriving machine — quickly adaptable for fast, clean driving of screws, nuts and studs. New folder contains full data. Write for your copy today.

15,049



**DETROIT POWER SCREWDRIVER  
COMPANY**

2801 W. Fort St.



Detroit 16, Michigan

*A Subsidiary of Link-Belt Company*

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## New Dealers and Distributors

Company	Address	Distributor for
R. H. Britton Machinery Sales, Inc.	East Syracuse, N.Y.	Clearing, division of U.S. Industries, Inc. Chicago, Ill.
H & G Sales Corp.	P.O. Box 1589 New Haven 6, Conn.	Russell Auto-Feed Screwdrivers, Needle Industries, Ltd. Studley-Redditch, England
Pratt & Whitney Co.	West Hartford 1, Conn.	Wade Tool Co. Waltham, Mass.
W. G. Jenks Machinery Co.	12417 Cedar Road Cleveland Heights, Ohio	Cincinnati Gilbert Machine Tool Co. Cincinnati, Ohio



# Guaranteed

**FOR 18 MONTHS  
AND THAT'S NOT ALL**

The unique new Clearing Torc-Pac is not just the finest design in the press field—it's the finest in quality and performance. That's why Clearing can guarantee these 22, 32 and 45 ton presses for 18 months. You get more for the money when you buy a Torc-Pac and more in performance too. Write for details.



## Clearing

DIV. OF U. S. INDUSTRIES, INC.  
6499 W. 65TH ST., CHICAGO 38, ILL.

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## BOOK REVIEWS

**THE GRINDING WHEEL.** Revised edition by William F. Schleicher, Vice-President and Editorial Director of Hitchcock Publishing Co. May be obtained by writing the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio. \$4.95

Based on the 1951 edition by Kenneth Lewis, the current revision contains over 100 pages of new material, bringing the total page count to 532. New chapters are: Mounted Wheels, Reinforced Wheels, Automation and Advanced Mechanization, and Safety.

Jig grinding, electro-assist grinding, optical projection grinding, filtering of grinding fluids, and grinding of ceramics are some of the new subjects which have been incorporated into standing chapters.

*The Grinding Wheel* is a practical textbook for all levels of readers. It can provide history for those who may be interested in background; "how to" type information for those seeking practical information; theory and research information for the more technically minded, and the over-all picture for the production and manufacturing executive.

**DESIGNING PARTS FOR COLD AND HOT HEADING.** Compiled and published by the Industrial Fasteners Institute, 1517 Terminal Tower, Cleveland 13, Ohio. \$2.

Manual provides data on the heading process and materials used, and "ground rules" for designing parts. The 60 studies indicate how hot or cold heading saved costs or simplified production or improved tolerances.

Representative chapter headings include: How Heading Produces Better

Parts at Lower Cost; Designing Parts for Heading; Designing for Secondary Operations; Drawings and Specifications; Effects of Electroplating on Dimensions.

**THE SELECTION AND HARDENING OF TOOL STEELS** Revised 1958, by L. H. Seabright, 263 pages, 6" x 9", \$7.00. Place orders with L. H. Seabright, 247 Berkley Ave., Elmhurst, Ill.

This book emphasizes the relationship between steels as they are actually used in industry. It classifies all standard tool steels, first into 12 main groups, and then into 40 sub-groups or "types," in which the group members are interrelated in terms of their properties and average hardening and tempering speeds. For each of the sub-groups, the book brings you complete data on heat treating and tempering. It likewise includes a concise discussion of the effect minor variations in composition have on the properties of the tool steel concerned, as well as of such heat treating developments as martempering and salt-bath quenching. An alphabetical index of the tool steels is included, listing the manufacturer, the type, the page on which the chemical analysis will be found, and the page giving the heat treatment for that type of steel. To metallurgists, tool steel users, tool designers, heat treaters—anyone concerned with the performance of tool steels—the book offers a quick, easy method for singling out the tool steel which fits your needs most accurately. Here is an easy-to-understand discussion of the selection, application, and hardening of all important tool steels in use today.

• • •

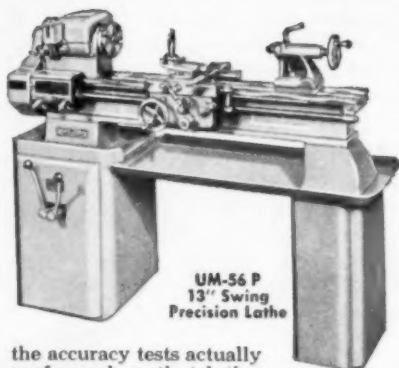
# SHELDON Precision LATHES

## for the size Lathes You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13" . . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units—either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of

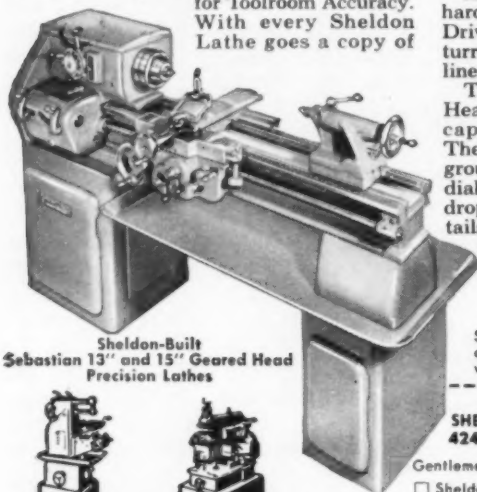


UM-56 P  
13" Swing  
Precision Lathe

the accuracy tests actually performed on that lathe. (19 checks).

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.



Sheldon-Built  
Sebastian 13" and 15" Geared Head  
Precision Lathes



SHELDON  
Horizontal Milling Machine



SHELDON  
12" Shaper

**SHELDON MACHINE CO., Inc.**

Builders of Sheldon Lathes, Milling Machines,  
Shapers and Sebastian Lathes.

4242 North Knox Ave. • Chicago 41, Ill.

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

**SHELDON MACHINE CO., INC.**  
4242 North Knox Avenue, Chicago 41, Illinois

Gentlemen: Please send new catalogs describing:

- ☐ Sheldon ☐ 10", ☐ 11" ☐ 13" Lathes  
☐ Sebastian 13" and 15" Geared Head Lathes  
☐ Horizontal Milling Machine ☐ Name of Local Dealer  
☐ Sheldon 12" Shaper ☐ Have representative Call

Name ..... Title .....

Company Name .....

Street Address ..... ☐ Company

City ..... ☐ Home

State .....

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### Power, Rigidity Built into 19" Column Radial

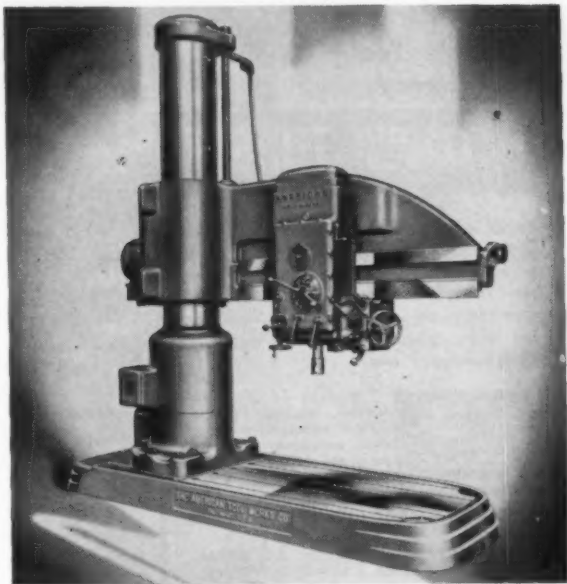
The American Tool Works Co., Cincinnati 2, Ohio, has added a 19" column model to its line of Hole Wizard radials. This new size is available with 6, 7, and 8 ft. arms and with a full complement of accessories.

Particular emphasis has been placed upon power, rigidity, stability and convenience of operation. The machines are designed and proportioned to transmit the full overload capacity of 30 hp motors, while the column and arm designs are such as to permit the utilization of this power with the minimum of deflection and resultant work inaccuracy.

Machines also perform accurate boring, counterboring and spot facing operations. The boring mill type spindles are precision Timken bearing mounted with convenient adjustment from the outside of the head.

For tapping, the machine provides a 40% speed-up of the spindle in reverse in order to minimize the unproductive time of backing the tap out of the tapped hole.

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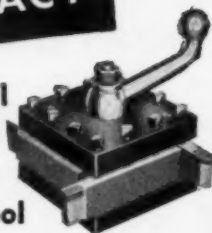
Machine drills, bores, counterbores, spot faces, taps.

### Broaching Machine is Bench Size Pull-down Type

The small Eager Beaver pull-down broaching machine is midget size rated  $1\frac{1}{2}$  tons at 5 ft. per minute broaching speed and  $\frac{3}{4}$  ton at 10 ft. per minute. Built with a 12" stroke, standard equipment comprises two cutting speeds and mechanism for adjusting the stroke. The tooling, coolant system, and elec-

**+ .0005  
- ACCURACY**

**Here's Real  
Precision  
*Plus*  
Multiple Tool  
Efficiency**



## ENCO TOOL POST TURRETS

Boost lathe production, cut costs, reduce tool switching and re-checking, cut set-up time, with ENCO 12-station tool post turret! Holds 4 maximum size tools . . . 3 working positions each. Sturdy and rigid for hogging cuts, yet unsurpassed for close-tolerance work.

### ON-THE-BALL

### RE-INDEXING

Spring loaded balls locked between perfectly milled spherical seats provide consistent re-indexing accuracy. "On the ball" every time!

**There's an ENCO turret for every lathe.**

Mail coupon for cat. #53 and name of nearest Enco Franchise Dealer.

**ENCO Mfg. Co.  
4520 W. Fullerton  
Chicago 39**

**ENCO Manufacturing Co.  
4520 W. Fullerton.  
Chicago 39. Dept. 269**



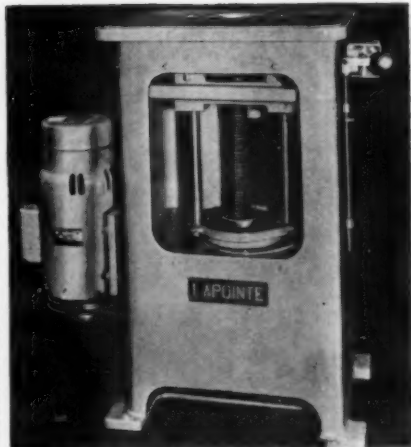
Please send catalog #53 and full details of ENCO 12-station tool post turrets.

Name

Firm

Address

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31" wide, 20" front to back, 34" high.

trical equipment are extra.

This bench size machine is only 31" wide, 20" front to back, and 34" high. The hole in the drawhead is 1½", the hole in the platen is 5", and the platen dimension (working surface) is 17" x 18½".

The machine has a mechanical screw type drive with all moving parts lubricated. It is designed for an automatic broach puller and coolant.

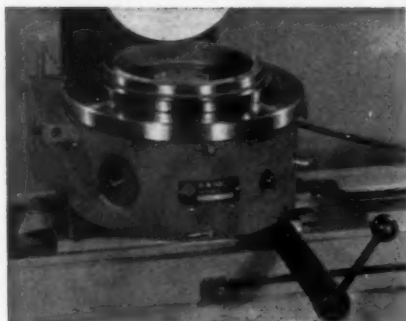
Though small and compact, it is built for precision broaching and is said to perform with outstanding accuracy on all work of a size and type within its capacity. Such parts as lock cylinder barrels, various slots, and other internal applications are broached easily on this machine, and in certain instances, external and surface broaching can be performed satisfactorily. Price of the machine is \$970.

LaPointe Machine Tool Co., Hudson, Mass.

Use postpaid card. Circle No. 81

## Rotary Table Redesigned

Model 710-V Roto-Grind is a new design, featuring variable speed control (20 to 60 rpm); a forward and reverse switch; a clutch for hand operating;



Variable speed control, forward and reverse switch, clutch for hand operating, new casting are changes made in new model Roto-Grind

new casting (the motor is enclosed). It is designed to fit on these surface grinders: Reid, Brown and Sharpe, Boyar-Schultz, Covel, Taft-Peirce, Thompson, Bridgeport, and others.

The table transforms a surface grinder into a rotary grinder to grind rough or precision work. It can be set up vertically for internal or external grinding.

The variable speed transformer is provided to give the correct rpm in relation to the surface feed required in grinding. Extreme accuracy, up to 20 millionths tolerances, can be obtained on grinding large rings, offset holes, radii, contours, etc. It has a disengage clutch for hand-operation and indicating purposes. Sizes: 6", 10 $\frac{5}{8}$ " and 15" diameter. A magnetic chuck is available.

M & M Tool & Mfg. Co., 1124 E. Third St., Dayton 2, Ohio.

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# HOLES



DOES JOBS NO DRILL CAN DO

**Clark** "HOLE MAKER"  
P. O. BOX 990 BEVERLY HILLS, CALIF.

Use postpaid card. Circle No. 326

June, 1959

Another

## VICTOR VALUE

Top Quality  
Lowest Prices

Our Special Import...

### DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
1/4	\$ 6.00	\$ 2.85
1/2	12.00	5.00
3/4	21.00	7.50
1	30.00	10.25
1 1/2	54.00	15.00
2	75.00	20.00
2 1/2	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for \$1.00 each extra.

Order today—Immediate  
Delivery From Stock!

## VICTOR

Machinery Exchange, Inc.

Dealers in Tool Room Equipment

Dept. A, 251 Centre St.

TeL: CAnal 6-5575, New York 13, N.Y.

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## High Speed Balancers Simplify Vibration Elimination

Eliminating vibration from miniature high speed rotating parts, or assemblies containing high speed rotating parts, has been simplified by a new line of high speed bench type balancers specifically designed to handle miniature belt-, air-, or electrically self-driven parts or assemblies. Typical work includes miniature armatures, aircraft and missile gyros, small spindles, turbines, textile parts. Both horizontal and vertical models are available.

Unbalances causing work support movements which are greater than .000002", with the work rotating at any



**Gisholt HS-1 balancer** set up to balance an electrically self-driven missile gyro. Optional photocell, below work-piece, measures angle of unbalance in relation to a single reference line on the rotor. Meters at the top right indicate unbalance amount and angle; expanded scale tachometer, lower right, indicates rotational speed. Corrections are made on the drill press, shown at left.

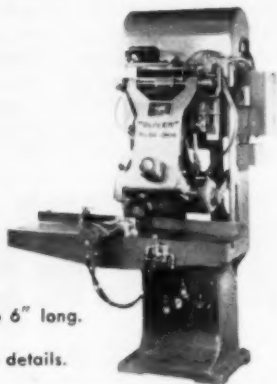
## "OLIVER" No. 94-DHM HYDRAULIC CUT-OFF SAW

**Cuts nonferrous metals  
without burr and at a  
high rate of production**

For aluminum extrusions, billets, copper and brass bars, tubing, etc. Designed for precision performance.

Saw: 14" std. for 3" cuts; 20" max. for 6" cuts. Stroke: 28 per minute maximum for 6" wide material. Table is cast iron

15" x 48" with aluminum throat plate and opening with chute for automatic removal of pieces up to 6" long.



Write for full technical details.



**OLIVER MACHINERY COMPANY**  
GRAND RAPIDS 2, MICHIGAN

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speed between 100 and 3000 or between 4000 and 12,000 rpm, can be measured and located. Standard equipment includes an amplifier, a direct reading amount of unbalance meter, and a strobe lamp assembly to indicate angle of unbalance.

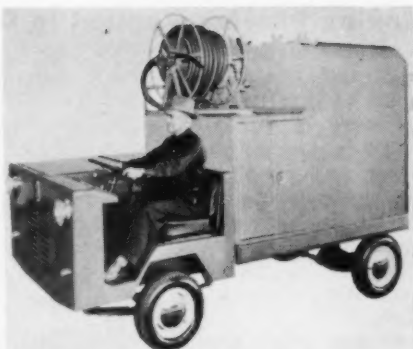
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

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## Self-Propelled Vehicle Services Machine Tools

The Gorske self-propelled coolant servicer blends coolant and meters it to machine tools all in one operation. The operator selects the proper soluble oil for the machine tool to be serviced and sets the ratio of oil to water on the metering dial. A counter, reading directly in gallons, is set for the quantity of coolant to be delivered.

The water metering pump is driven by a fixed ratio drive from the engine power take-off. The oil metering pump is driven from the take-off through



Coolant mixed, delivered in 2-3 minutes.

an infinitely variable speed drive with micrometer adjustment calibrated in percentage of oil to water. The coolant servicer carries four oil tanks of 50 gallons each and a 300 gallon water tank.

Gorske Industrial Equipment, 132 E. 30th St., Indianapolis, Ind.

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## Improve your PRECISION ... and PRODUCTIVITY!

... switch from "dead" center to

## VEE-ARC SUPER-PRECISION "LIVE" CENTERS

Guaranteed Accurate to  
.000020" (twenty millionths)

### SUPERIOR FEATURES

- Extended spindle - carbide tipped
- Life-time lubricated, pre-loaded ABEC-7 ball bearings
- Spring compensation to .020" axial growth without impairing accuracy
- Heat treated, stainless steel construction



Designed for  
ULTRA-PRECISION  
TURNING and  
GRINDING OPERATIONS!

For your convenience, also available through your Monarch and Cincinnati distributors

VEE-ARC CORPORATION, Dept. BB-6, Westboro, Mass., U.S.A.

Mail  
Coupon  
Now!

Please send Bulletin 1282 on Vee-Arc Live Centers to:

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Street \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

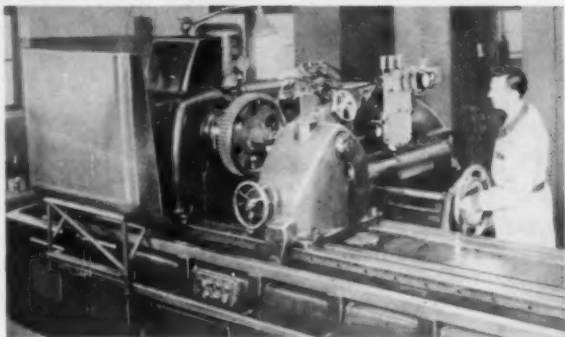
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## Honing Process Applied to Gears up to 200-In. Dia.

A new method that will enable manufacturers of spur and helical gears in the 12-in. to 200-in. dia. ranges to economically apply the gear tooth honing process has been developed by National Broach & Machine Co., 5600 St. Jean Ave., Detroit 13, Mich.

As applied to a prototype model (illustrated) the method **makes use** of separate tool heads and feeding mechanisms that enable one large rotary machine to perform both the gear tooth shaving and the gear tooth honing operations.

Separate heads are utilized since the method used for contacting the tool with the work is basically much differ-



Honing head performs finishing operation on spur gear.

ent for gear tooth honing than it is for rotary gear shaving. The Red Ring honing method makes use of a tilting table. For large gears, this arrangement takes the form of a hinged tool head that enables controlled light pressure



## BONDED to your needs!

Because, Clipper Diamond Wheels come in three different types:

**Resin-Bonded:** Most commonly used for dry grinding all types of carbide. Fast. Stays cool.

**Metal-Bonded:** Usually for grinding glass, quartz, ceramics, carbides, etc.

**Ceramel-Bonded:** Featuring a ceramic vitreous bond for fast cutting and long life. No glaze, even if steel is ground with carbide.

Tell us your grinding requirements. We'll provide the *right* diamond wheel.

**GET YOUR COPY!**

*New Clipper Catalog CW58 sent on request.*

**Clipper Diamond Tool Co.**

345 HUDSON STREET, NEW YORK 14, N. Y. • CHelsea 2-7143

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to be applied between the honing tool and the work gear. Rotary gear shaving, being a free-cutting, metalworking stock removal process, requires no such special tool mountings or control of work pressure. Other essential differences between shaving and honing lie in the speeds of tool rotation and cutting fluid requirements. Light honing oil is used for honing operation, whereas much heavier cutting oils are used for

gear tooth shaving.

The Red Ring honing process for large gears can be applied immediately following the shaving process to improve surface finish on gears that are processed in the semi-hardened state; or used immediately following the hardening process where gears are hardened to levels above cutting tool metal removal ranges.

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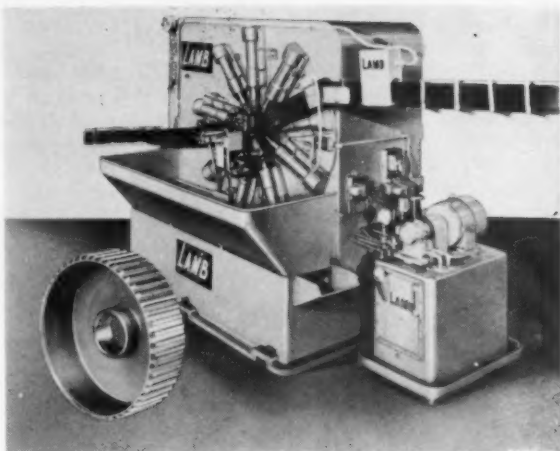
**RED RING PUNCH & DIE**  
 INCORPORATED  
 Jamestown, New York

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## Machine Drills 4320 Holes per Hour

Nine .090" diameter oil holes, equally spaced around the periphery of automatic transmission clutch hubs, are drilled simultaneously by a machine built by F. Jos. Lamb Co., 5663 E. Nine Mile Rd., Detroit, Mich. The production rate is 480 parts per hour. Machine operation is completely automatic. An operator is not required.

Parts are gravity fed to the machine load mechanism in Fabri-Flex chuting. A hydraulic cylinder strips each part out of the load mechanism and moves it forward into drilling position. Two gear teeth straddle a single guide rail which provides ra-



dial positioning for hole locations. The hydraulic cylinder also acts as a clamp during the drilling operation. A disap-

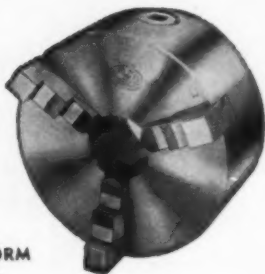
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FINEST!**

## **CVA** **3 JAW GEARED** **UNIVERSAL SCROLL** **LATHE CHUCKS**

**WITH AVERAGE GUARANTEED ACCURACY  
OF .002" THREE INCHES FROM JAW FACE**

... And these  
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great features

**ONE PIECE BODY  
FLAME HARDENED JAW WAYS  
INDUCTION HARDENED SCROLL FORM  
COMPLETE WITH 2 SETS OF JAWS  
AND CHUCK WRENCH**



Size	Weight	Dia. of bore	Price*
3 1/2"	6 Lbs.	5/8"	\$34.00
4 1/2"	6 Lbs.	1-1/8"	34.00
5 1/2"	11 Lbs.	1-1/2"	40.00
6 1/2"	16 Lbs.	1-11/16"	46.50
7 1/2"	26 Lbs.	2-1/4"	55.00
9"	38 Lbs.	2-3/4"	70.00
10 1/2"	68 Lbs.	3-1/2"	86.00
12"	106 Lbs.	3-7/8"	115.00

\*Prices f.o.b. warehouse, N.Y.C.  
Back plates available at extra cost.

These are superior chucks produced by an English manufacturer famous for precision built machine tools and represent unbeatable values. A certificate is supplied with every chuck attesting to and guaranteeing its accuracy. All parts are guaranteed for a year against defective workmanship and materials. Repair parts available.

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Telephone CAnal 6-4992

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pearing locating pin in the center diameter of the part provides a bearing surface for machining thrust.

Nine spindles are mounted radially on the vertical face of the machine. They are electrically driven and hydraulically fed. Feed stroke and return for all nine spindles is controlled by a single circular cam. Upon completion of the drilling cycle the load-clamp cylinder

and the locating pin retract, dropping the part into an unload chute for movement to subsequent operations. Provision is made to retract the spindles an additional 4 inches for tool change.

The drilling operation can be performed with or without coolant. An electrical push-button panel permits manual machine cycling.

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## Stroke, Rotary Counters Improved

Modification in the design of their entire "D" series of light duty stroke and rotary counters has been announced by Durant Mfg. Co., 1928 N. Buffum St., Milwaukee, Wis. The entire counter frame has been retooled to incorporate changes that will improve the mechanical action of the instruments and will provide a better cover seal against dust or dirt. Although the new frame is approximately  $\frac{1}{8}$ " longer than the old style, the dimensions between the mounting holes have not been changed.

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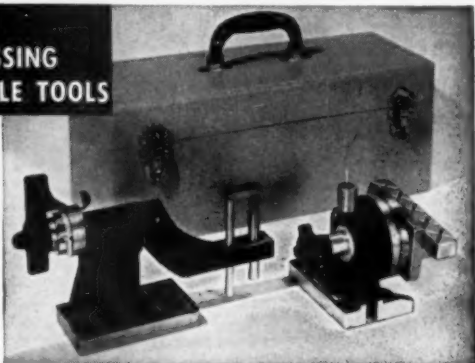


Counter frame retooled.

## Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

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BUT TOPS AT ONLY \$149.50**  
(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1"; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.



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## COMPANY

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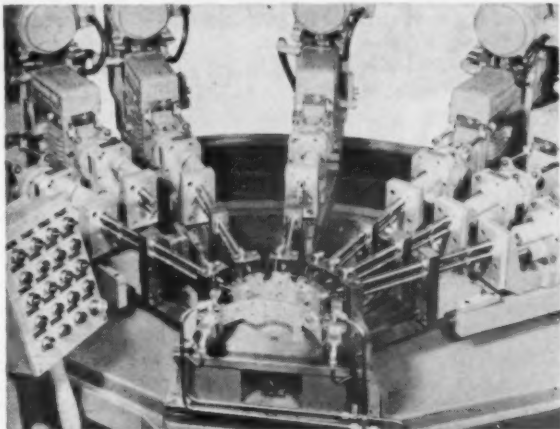
PROVIDENCE 7, R. I.

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## Application Demonstrates Versatility of Drill Units

Almost any hole pattern is possible with Drillunit quill-type drilling units. One recent setup was designed for a major supplier of brake assemblies—for passenger cars, trucks, tractors, and earthmoving equipment.

The seven drilling units shown here are capable of producing 121 different hole patterns. A single operator can drill 3600 brake bands into the fixture. The drilling units can be moved left or right and forward or back to obtain the desired hole pattern. The various depths required are set by the stroke—maintained by an internal positive stop to an accuracy of  $\pm .0005$ —by means of



These 7 units can produce 121 different hole patterns.

a convenient external adjustment.

Also incorporated into this application is an adjustment of just one nut per unit to permit pre-setting the angle gage. The units can be used in com-

## SUPER COMPARATOR

### Gaging Head by Mahr

Reading in 20 MILLIONTHS of an inch

ACCURACY over entire range  $\pm 10$  MILLIONTHS

RANGE of dial  $\pm .001$ "

SPACE between graduation lines .0354"

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The measuring pressure is 100 grams making this comparator most sensitive and accurate.



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hair thin  
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Fine  
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bination to drill or counterbore.

Drillunit, Inc., 3267 Wight St., Detroit 7, Mich.

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## Two New Stainless Steels for Nuclear Applications

Universal-Cyclops Steel Corp., Bridgeville, Pa., has announced that two new nuclear stainless steels are now commercially available. One is a low, low cobalt stainless used for con-

tainers and internal structural members in atomic reactors. The other is a high boron stainless for reactor shielding and control rods.

The ideal stainless steel for nuclear applications should have no cobalt. However, the complete elimination of this element is not feasible at present. Universal-Cyclops is producing AISI Type 304L stainless steel with a low, low cobalt content which is safer for



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- Highly accurate. Ball size held to  $\pm .0001$ " for fixture balls;  $\pm .00002$ " for checking balls.
- In stock: Types 224 and 448 in 7 ball sizes,  $\frac{1}{4}$ " to 1" by  $\frac{1}{8}$ " steps; Type 348, with  $\frac{1}{2}$ " ball and shouldered shank tapped 6-32. Other sizes to order.

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atomic nuclear applications. Cobalt is an unwanted element in nuclear power plants because under irradiation it transforms to cobalt 60 which is a high gamma ray emitter and is very harmful to human beings. Also, under high temperatures and corrosive conditions the cobalt could be leached from the stainless steel and poison the nuclear system.

Type 304L stainless is desired for many nuclear applications because of

its favorable neutron cross section, corrosion resistance and good weldability. Ordinarily, Type 304L contains between 0.05% and 0.2% cobalt, or 500 to 2,000 parts per million. The new product sharply reduces these problems, since it has less than 0.002% cobalt or less than 20 parts per million.

The second new stainless steel has a high boron content, which is claimed to present a marked advance in the engineering and production of stainless

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Self-locking Acme screws hold load safely, securely, at any height. Roller bearing wheels.

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No projecting parts—all four sides accessible; crank studs at both ends; three table surfaces.

**ECONOMY**  
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4505 W. Lake St.  
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steels for use in atomic and nuclear applications. This new steel has been used for shielding and control rods in atomic energy systems. High boron stainless was developed as a substitute for hafnium metal, which is usually desired for these applications. Hafnium is in relatively short supply, and the total production is earmarked for the Atomic Energy Commission.

Boron is a neutron absorber and

therefore can control the rate of operations within a reactor. The new high boron stainless steel (2% natural boron) has a combination of physical and nuclear characteristics which are similar to hafnium, including high thermal neutron absorption, good structural stability, acceptable mechanical properties at 500°F under irradiation, and good corrosion resistance.

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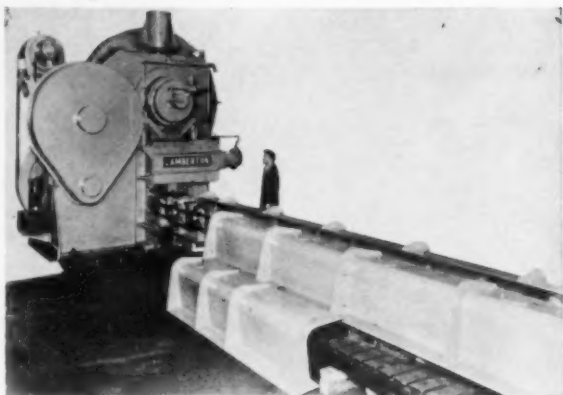
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## Billet Shear is Scotch Import

The billet shear shown here is one of a line developed by Lamberton & Co., Ltd., Coatbridge, Scotland, and sold and serviced in the U.S. and Canada by Girard Associates, Chambersburg, Pa.

These shears are designed to cut accurate, consistent lengths, with true ends. They are provided with manual or pedal controls, or designed to cut automatically at high speed with synchronized conveyor feed. The measuring stop has a coarse and fine adjustment with a final accuracy within any normal working tolerance.

The stop mechanism is air operated. When the hold-down clamps the billet



**Billet shear** cuts accurate lengths, with true ends.

the stop automatically retracts and the shear completes a stroke. Thus the shearing shock does not disturb the accuracy of the measuring stop setting, nor does the shear stroke begin until the hold-down is engaged.

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immediate shipment on complete line

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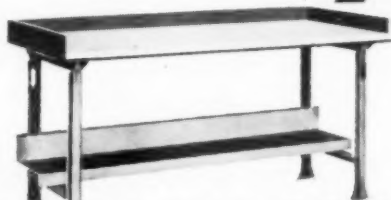
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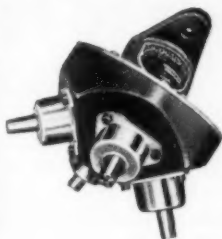
A slip-clutch between flywheel and drive shaft prevents overload. The clutch engages only when the dogs are in the correct relative position, minimizing shock and wear. The shear blade is guided well below the lowest cutting point to insure rigidity. An adjustable stroke cut-off on these shears allows the blade to return to its upper position as soon as the billet has sheared, thus reducing blade wear and producing a truer end surface on the billet.

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## Certified Maintenance For Comparator Owners

Jones & Lamson Machine Co., Springfield, Vt., has introduced a new service and maintenance policy for owners of its optical comparators. A written, dated certificate of precision for each comparator is given to the owner after each of the four-per-year inspections by J&L trained specialists. This will fulfill all government speci-

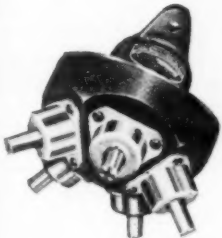
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DRILL, REAM, COUNTERSINK, COUNTERBORE on the same drill press! No need to set up for each operation. A simple rotation of this turret head brings any of 4 drills or cutting tools into position. Speeds production—cuts cost!



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fications for written certification on gages used on government contract work.

The Certified Maintenance inspectors will check all adjustments on all of the customer-owned comparators covered in the agreement and maintain the accuracy of adjustments and operation of each one. Special bulk prices are offered for this service, or a single machine can be so covered.

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## Machining Space Age Metals

The extreme hardness of Space Age metals presents a real problem to the manufacturer who must finish machine them on a production basis. Electrolysis, the science of deplating metal, is claimed by the Standard Electrical Tool Co., manufacturers of super precision spindles, to be the only successful method of accomplishing this.

Considering the tensile strength of

# Rocket TAP SHARPENERS CUT TAP COSTS UP TO 75%



### MODEL 50 FOR 2-3-4 FLUTE TAPS

Handles tap sizes  
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### MODEL 50 WITH F-1 FINGER ATTACHMENT

Handles tap sizes  
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**ROCKET** Tap Sharpeners handle all production tap sizes from 0 to 2 1/4 inches. Set-up time is less than a minute—sharpen taps to like-new condition with a time and labor cost of only a few cents each. Push button controls assure accurate sharpening—no special skills required.

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- ▶ Gives precision grinding for straight or spiral fluted taps
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**No. 2000RLY (left) and No. 6028LY spindles**

these materials, electrolysis is a "cold" process delivering rapid metal removal with simultaneous micro finish without introducing heat into the material, thus eliminating metal fatigue or distortion.

Electrolytic metal removal is accomplished by dc electric current delivered by a power supply that converts ac current from an ordinary power source to low voltage, high amperage dc current.

The No. 2000RLY super precision spindle, shown at left in photograph, is designed for a 600 amp dc power supply, equipped with a 5 hp, 1800 rpm alternating current motor, belted drive with speed change to satisfy 6", 8", 10", 12" and 14" straight or cup grinding wheels. The spindle assembly on the vertical feed provides for a 9" traverse parallel with the spindle.

No. 6028LY, at the right, is a direct driven alternating current motorized

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unit,  $7\frac{1}{2}$  hp, variable horsepower constant torque, with speeds of 3600, 1800, 1200 and 600 rpm. The slip-ring of this spindle is designed for 3000 amp power supply. This is a versatile unit suitable for mounting circular well adapter plates for cup wheels, but illustrated with wheel holder to mount straight grinding wheels. A  $360^\circ$  swivel base is assembled between the motor base and the feed base or slide. Wheel

sizes for this four-speed unit will range from 6" to 18" diameter cup wheel and 14" to 20" diameter straight wheels.

The slide or feed arrangement at the right is with exposed ways, while the illustration at the left shows accordion way protectors.

The Standard Electrical Tool Co., 2488 River Rd., Cincinnati 4, Ohio.

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The Pear tool & cutter grinder Model 3/Zn, for three dimensional pantographs, is said to cut every concentric and ex-centric type of shape by the rotation of the axis of the tool in relation to the material to be worked. It prepares cutters which are usually used for executing engraving and profiling work made by pantograph.

With this machine it is possible to give the tool the required geometrical shape and its profile the right clearance according to the work. It affords sharp profiles having cylindrical shape, cylindrical shape with round angle, cone-shape, truncated cone with round extremity, spherical shape, etc. All the angular and linear movements which determine such shapes are fixed by special verniers, thus it is possible to resharpen the tool several times without



Model 3/Zn prepares cutters for pantograph work.

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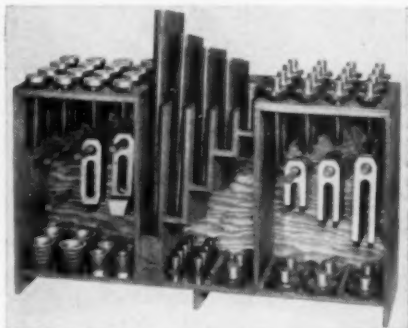
Write for Specifications and Data Sheet No. 12. These new extensions will be sent for 30 days Free Trial, if requested.



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## Clamp and Jack Set Solves Holding Problems

For use on planers, boring mills, radial drill presses, milling machines, and most other machine tools, this clamp and jack set is offered in three



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sizes (A, B, and C), for light, medium, and extra heavy work. Each set is packed in a handy storage cabinet.

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Sketch shows! GS-5 Recessed Snap Gage to Check Dimensions in undercut on Shafting

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MATCHED** to your machine and manual  
operations. A wide range of Silicon Car-  
bide and Aluminum Oxide grains and tex-  
tures, grades extra fine to extra coarse, in  
soft, firm and tough rubber binders.



Use postpaid card. Circle No. 349

## Free Cabinets Offered With Plug Gage Sets

Special sliding-drawer steel cabinets for conveniently storing "Tri-Lock" deluxe precision plug gages are now available free of extra cost with complete or sectional sets of the gages. The cabinets protect the gage members against dust, dirt, scratches, and rust. Each contains a lacquered hardwood block drilled with properly sized, clearly marked holes to hold members in correct position for easy locating.

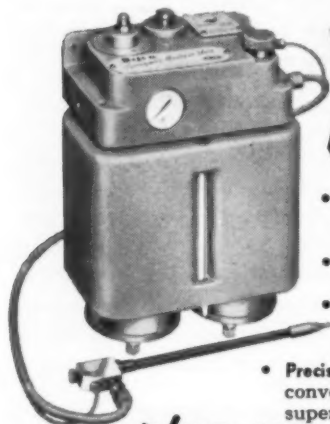
Tri-Lock deluxe plug gages are precision ground and lapped from finest quality tool steel, feature guaranteed tolerance of plus or minus seventy millionths (.00007). The complete line includes sizes from .750" to 1.000" in increments of .001"—a total of 251 sizes, to serve almost all plug gage needs.

Dundick Tool Works, Inc., 3410 W. 31st St., Chicago 23, Ill.

Use postpaid card. Circle No. 94



Interlocking device enables two or more sections to be fastened together quickly and easily to form a compact, handy unit.



COMPARE

# Spraymist<sup>®</sup>

ENGINEERED BY

## BIJUR

### Only Spraymist Provides

- **Compact, Unit Design** — Includes ALL necessary controls: — Trap-Filters — Regulator — Gauge — Solenoid Valve — Reservoir.
- **Automatic Operation** — Mist starts and stops automatically with machine.
- **Pressurized Reservoir** — Prevents clogging or siphon lift problems — Provides more uniform flow — Permits extending system to as many jets as needed.
- **Precision Mist Control** — Needle Valve at each jet allows for convenient control of uniform, continuous mist, from superfine to heavy spray — Easily replaceable jet tips.
- **Machine tool styling** — Fully protected against corrosion — Sturdy construction — Choice of 18 ounce, 1 gallon or 5 gallon reservoir capacity.

*plus:*

Write today for Bulletin MTF-7, and the name of your nearest SPRAYMIST distributor.



A product of

# BIJUR

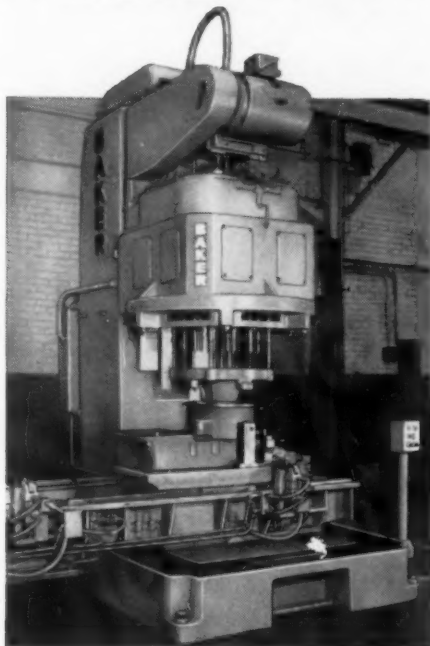
LUBRICATING CORPORATION  
Rochelle Park, New Jersey



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A special machine job done by a

# STANDARD BAKER® ADJUSTABLE SPINDLE MACHINE



Baker A-24-VU Adjustable Spindle Machine with standard 36" round, universal head and standard slip plate bored for 46 spindles.

An automotive contractor wanted to avoid special machine costs in handling heavy, awkward truck transmission housings. He also desired retooling economy.

THE RESULT: This BAKER A-24-VU Standard Adjustable Spindle Machine, fitted with slip plate, bushing plate and transfer, including a pallet to hold and transfer the work piece from prior operations.

The BAKER drills 2 sets of bolt circle holes on the top flange and 1 set at the housing bottom. A bushing plate, supported on the slip spindle plate, guides drills and targets into pallet bushings for positive location.

This BAKER Standard gives the necessary high production and is easily removed from the transfer line for other drilling and tapping operations.

For the complete story on how BAKER Standard Adjustable Spindle Machines can solve your special production problems, write Baker Brothers, Inc., 1000 Post Street, Dept. TH-659, Toledo 10, Ohio.

THIS IS REAL

*Flexibility*

NOW... COMPLETELY INTERCHANGEABLE

TO FIT 3 SIZES VERTICAL MACHINES	21 27 3	ADJUSTABLE SPINDLE HEADS FIXED SPINDLE HEADS TYPES STANDARD TABLES	TO FIT 3 SIZES HORIZONTAL MACHINES
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# BAKER®

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES

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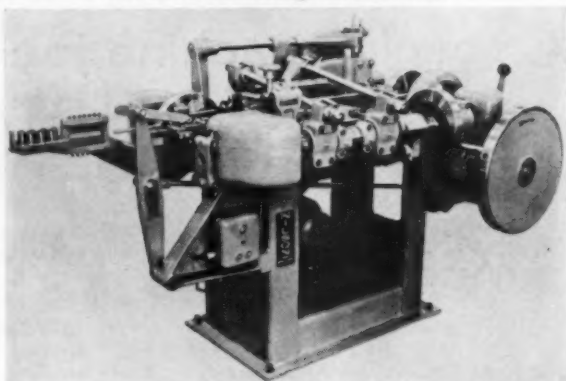
## Space-Saving Model of 4-Slide Forming Machine

The A. H. Nilson Machine Co., 600 Bridgeport Ave., Shelton, Conn., has announced a stronger, more compact No. S-1-F combination press and 4-Slide forming machine. The new unit is now mounted on a welded steel pedestal base.

To achieve minimum floor space, the variable speed motor drive is positioned directly in back of the machine instead of on the end.

Floor space required is only 53" x 57", a reduction of more than 1000 square inches from the previous model. Other new features include double gibs, a twin disc clutch and redesigned gear guards.

The S-1-F Machine, designed primarily to stamp and form ribbon metal



Motor drive is in back of machine instead of on end.

in one operation, will also form wire with a maximum feed length of 8". It can handle wire up to 3/32" in diameter and ribbon metal up to 1 1/4" wide. The built-in press section has a 3/4" stroke and a maximum pressure capacity of 8 tons.

Use postpaid card. Circle No. 95

**JAM PROOF**

**AUTOMATIC THRUST ADJUSTMENT**  
Spring loaded spindle maintains constant tail stock thrust.

**LONGER LIFE**  
Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

**FASTER SPEEDS**  
Smaller turning radius gives much higher RPM rate than ordinary live centers.



**CONCENTRIC** the original,  
**LIVE CENTERS** patented  
spring loaded live centers

**GREATER LOAD CAPACITY**

**LESS OVERHANG MEANS MORE RIGIDITY... MORE WORKING RANGE**

Write Today for Complete Information

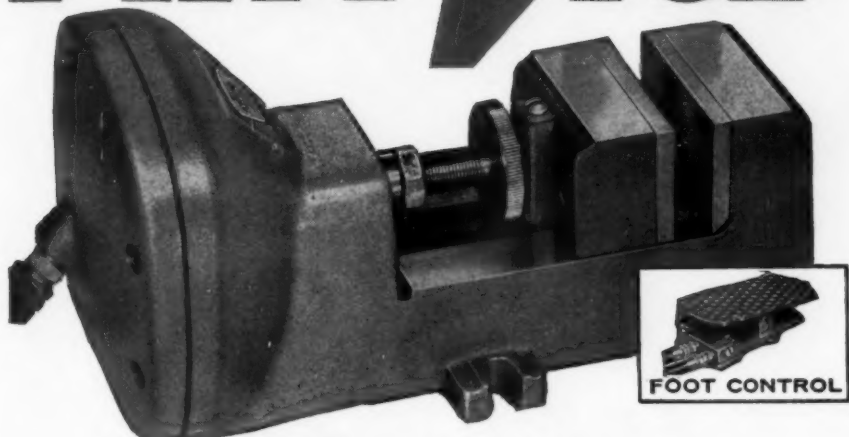
Pat No. 2,520,473



**CONCENTRIC TOOL CORP.,** 2486 Huntington Dr., San Marino, Calif.

Use postpaid card. Circle No. 352

# *Speedy* **AIR VISE**



## **HIGH SPEED • POWERFUL GRIP**

New, improved model speeds up all repeat operations—*milling, drilling, tapping, punching, bending, riveting*. Both hands left free to produce more! Light squeeze to 2250 pounds pressure! Extra thick jaws for attaching jigs. Jaws open to 3 inches;  $\frac{1}{16}$ " to  $\frac{3}{8}$ " maximum travel. With foot control and air hose. **\$44.00**



**SPEEDY  
AIR REGULATOR**  
Regulates 0 lbs. to 140 lbs. from tank or air line up to 250 lbs.  
No. 622 \$7.25



**SPEEDY  
AIR FILTER**  
Assures clean oil-free air. Large chamber with drain cock. Up to 250 lbs.  
No. 140 \$4.00



**SPEEDY AIRLINE UNIT**  
Complete, low cost production spraying unit for factory lines. External Mix Spray Gun, 15 ft. hose.  
No. 705 \$26.50

Order from Your Supplier or Write for Air Tool Catalog

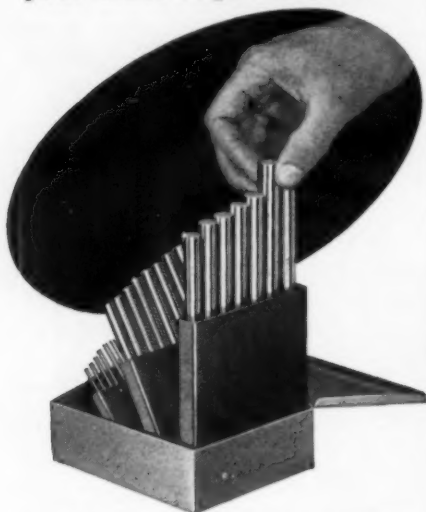
**W. R. BROWN CORP.**

2643 N. NORMANDY AVE., CHICAGO 35, ILL.

AIR REGULATORS • AIR VALVES • AIR FILTERS • PAINT SPRAYERS • AIR COMPRESSORS

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*Now available in 182  
standard sizes to meet  
your exact requirements*



# ACE

## hardened high speed steel DRILL BLANKS

These versatile, low-cost drill blanks are made of top quality, uniformly hardened high speed steel precision ground to exacting tolerances to meet the requirements of countless applications. Ideal for use as dowels, punches, knockout pins, gages, and rollers. Readily adaptable to form a wide variety of end cutting tools, too. And they're offered now in 182 standard stock sizes and in sets as shown.

Call your local Ace Drill Distributor today!



## ACE DRILL

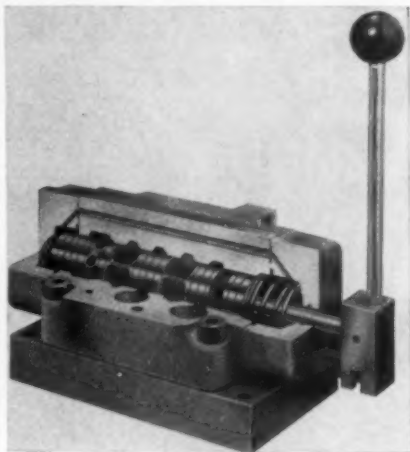
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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## Manually Controlled Hydraulic Valves

A new line of 3000 psi hydraulic valves, known as the Model 6100, is sub-plate mounted and manually controlled by lever. There are five actions



Cross-section view of 6100 high pressure valve.

available: 1. moved manually to either end position; 2. moved manually to "in" position and spring-offset to "out" position; 3. moved manually to "out" position and spring-offset to "in" position; 4. spring centered; and 5. ball detent where valve piston is held in either end position by detent.

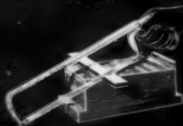
Large unrestricted passages allow great flow capacity. For example, the 1" size is rated at 28.2 gpm at 15' per sec. The piston has extra long sealing surfaces, and the spool is shock resistant by metering the fluid with its scalloped design.

The valves are available in seven basic spool designs and in sizes from 1/4" to 2".

Rivett, Inc., Brighton 35, Boston, Mass.

Use postpaid card. Circle No. 97

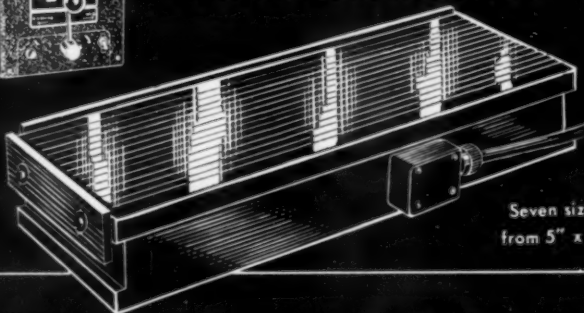
## ON BENCH WORK . . . ON SMALL MACHINE TOOLS



you'll get greater productivity with



### **MAGNA-LOCK** combination CHUCK AND RECTIFIER



Seven sizes  
from 5" x 10"

SEND FOR  
DETAILS,  
DEPT. BH59

Just right for surface grinders, layout, fixture work, drilling, many others. Low height, light weight, easy to handle. Simply plug into A.C. line. Shock-proof, moisture proof. All-steel construction.

*Hanchett* **MAGNA-LOCK CORPORATION**

BIG RAPIDS, MICHIGAN, U.S.A. - Telephone 815

Electrical and permanent magnet chucks, sine chucks,  
parallels, V-blocks, top plates, Magna-Vise



## NEW FLOOR MODEL A-F

### *Wilder*

## MICRO-PROJECTOR with VERTICAL LIGHT BEAM

**Quality Control plus Cost Control**

- Completely versatile. For production inspection or as contour measuring projector.
- Choice of 3 measuring stages 1" x 1", 2" x 2", 2" x 4".
- Full set of lenses between 10x and 100x magnification.
- Full length cabinet eliminates separate worktable.
- Detachable shelf optional.

Write for New 12 page catalog 357.

## OPTO-METRIC TOOLS, INC.

137BB VARICK STREET, NEW YORK 13, N.Y.

Use postpaid card. Circle No. 356

### All-Pneumatic Marking Unit For Flat Or Round Work

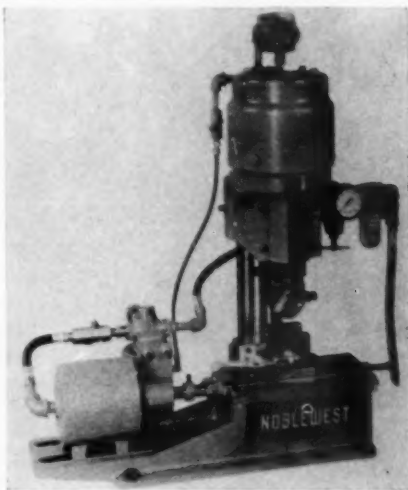
Model 501 all-pneumatic bench model metal marking machine is equipped with an air-operated die head which accommodates marking tools, and an air-operated work slide for custom made work fixtures. It uses roll marking dies for flat work, and flat marking dies for round work. Gap can be varied for small or large parts.

A foot control valve actuates cycle in proper sequence. Depth of mark is controlled by the air pressure setting.

The compact machine will mark steel, brass, aluminum, and other metals.

Specifications: 22½" x 12½" x 21"; weight, 140 lb.; reach, 3½"; gap, 6½"; length of mark, 2½".

Noble & Westbrook Manufacturing Co., Westbrook St., East Hartford 8, Conn.

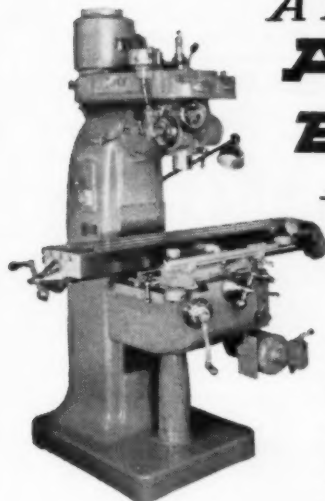


A foot control valve actuates cycle.

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*A Lot More*  
**POWER**

*A Lot More*  
**ACCURACY**  
**ECONOMY too!**

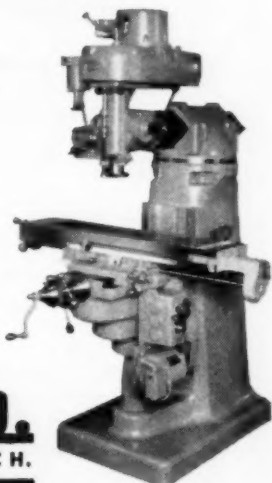


INDEX *"SUPER"* **55** VERTICAL  
MILL

- 1 1/2 HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

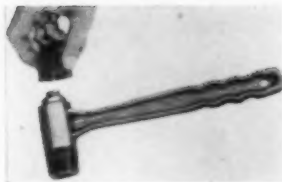
INDEX *"45"* VERTICAL  
MILL

- Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.



**INDEX MACHINE CO.**

543 N. MECHANIC ST., JACKSON, MICH.



Nylon or plastic tips

## Two-faced Hammer Has Floating Tip-Bar

The Safe-T-Grip hammer is of one-piece construction. Finger-fitting handle affords perfect balance for safer, less tiring work. The nylon or plastic tips attach to a tip-bar that floats within the hammer. Even with the tips loose, there is no danger of stripping threads. Tips are available in various hardnesses, from soft to extra-hard. They may be relocated to equalize wear. R. W. Hughes Industries, Inc., 2713 Ludelle, Fort Worth, Texas.

Use postpaid card. Circle No. 99

## WILLEY'S Pentagon

### UNCONDITIONALLY GUARANTEED

to out-perform any other style of carbide throw-away insert—for straight turning, boring, or facing applications—on any kind of material.

solid carbide



indexable insert



The pentagon is a cam ground, radii tangent, indexable insert of solid carbide. It presents 10 cutting edges at a 30° lead angle and each edge will produce more finished work than the edge of any other standard insert.

Not on tests alone—but in actual production; on various operations; machining all



types of materials—Willey's Pentagon more than doubled the best performance of all other inserts tried. It is proven superior . . . we guarantee it.

Try the pentagon! You'll save money. You'll do a better job—faster, and once used you'll never go back to fragile . . . high-cost . . . yesterday's tooling.

A complete catalog of Willey's carbide tool products is available on request.

Send your part print and present tool layout for prompt quotation



## WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor highway • Detroit 1, Michigan • Telephone: WOODWARD 1-9444

Use postpaid card. Circle No. 358



# For fast, economical cutting of flat metal shapes there are 7 MODELS OF Campbell Nibbling Machines

...with cutting capacities ranging from 3/32" mild steel for **MODEL 0** machine to 1/2" mild steel for **MODEL 530**, in sheet sizes from 16" or less, to 72".

CAMPBELL NIBBLERS are making tremendous savings in time and money for hundreds of users in aircraft and other metal-working plants.

...in fast cutting of ferrous and non-ferrous sheet metals or composition sheets.

...for moderate production runs or experimental development work.



Economical  
"throw-away"  
punch and die



Send for this  
catalog for com-  
plete information  
on this versatile  
production and  
experimental tool

• CAMPBELL NIBBLERS cut from 40 to 60 times faster than drilling or filing. A fast-moving punch (350 to 900 strokes per minute) operating over a die, nibbles out the design, taking a small "bite" with each stroke of the punch.

- ...for any and all kinds of shapes
- ...for either inside or outside cuts
- ...with no distortion of material—no internal strains  
—no invisible fractures—no burr
- ...with a "nibbled" edge that is sufficiently smooth  
to require very little finishing and sometimes none

CAMPBELL standard punches are made double end to double work life and halve the cost. Prices are so low (starting at 40c each, or 20c per working end) that new punches cost less than regrounding dull ones.

Here is a quick picture of CAMPBELL NIBBLING MACHINE Capacities

Campbell Nibbler Model #	Sheet Width	WORKING CAPACITY		Strokes per Minute
		Mild Steel	Alloy Steel	
0.....	16"	3/32"	1/16"	900
1A.....	20"	3/16"	1/8"	375-650
430.....	60"	3/8"	1/4"	350-525
436.....	72"	3/8"	1/4"	350-525
530.....	60"	1/2"	5/16"	350-525
2524.....	48"	1/4"	3/16"	375-650
2536.....	72"	1/4"	3/16"	375-650

## CAMPBELL NIBBLERS

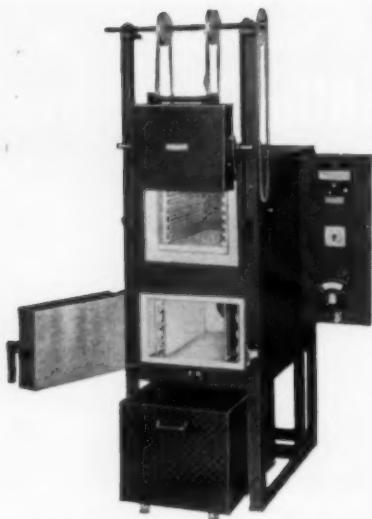
Wilson Mechanical Instrument Division  
AMERICAN CHAIN & CABLE

Dept. 937, 230 Park Avenue, New York 17, N.Y.

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**ACCO**





## SAVE SPACE WITH A SERIES 8055 COMBINATION MODEL

The Series 8055 is two electric heat treating furnaces (Hardening 2,000° F. and 2,300° F., and Drawing 800° F. and 1,250° F.) in the floor space of one furnace. Each furnace is independently controlled permitting hardening and drawing operations to be performed at the same time. All models are delivered with separate controls for each furnace. The 8055 series is made in nine standard sizes . . . other models are made to your specifications. Furnaces operate on standard line voltage . . . no transformer necessary. A hardening and preheating combination is also available.

Write for a free catalog of the entire Lucifer line. Engineering advice is offered without obligation. Write, wire or call . . .

## LUCIFER FURNACES, INC.

NESHAMINY 1, PA.

Phone: Diamond 3-0411

Use postpaid card. Circle No. 360

## Grinding Discs Offer Greater Margin of Safety

A new type of aluminum oxide grinding disc is designed to provide up to 25% greater operating safety. Called "Spitfires," they feature reinforced edges



Discs overcome limpness, excessive grit loss.

and a special built-in shape control which is said to eliminate limpness and disintegration due to excessive grit loss.

Discs are available in special, standard, and heavy duty models for a wide range of grinding and finishing applications. Their uses include light gauge metal sanding and polishing, light and heavy weld and braze removal, and high speed finishing. They are made in grit sizes 16 through 180. Diameters include 6", 7", 8" and 9 1/8" with 1/2" and 7/8" arbor holes.

Abrasive Products, Inc., Pearl St., South Braintree 85, Mass.

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## BRUSH TOP CANS For Layout Blue!



HANDY, ELLISCO BRUSH TOP CANS MAKE IT EASIER FOR YOU TO APPLY AND STORE LAYOUT BLUE. BRUSH KEEPS MOIST IN CAN. CONTENTS WON'T DRY OUT 3 OZ. TO 1 QT. CAPACITIES. GET DETAILS AND BULLETIN.

George D. Ellis & Sons, Inc.

4024 N. American St., Philadelphia 40, Pa.

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MACHINE and TOOL BLUE BOOK

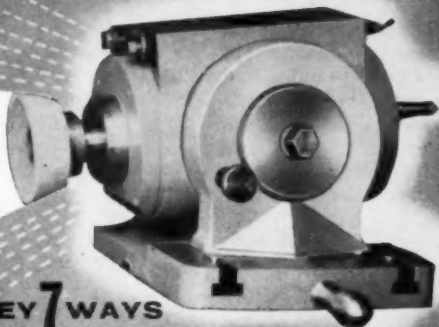
HERE'S AN

# ANGLE

AND A NEW APPROACH

THAT SAVES YOU MONEY **7** WAYS

ON ALL YOUR TOOL AND CUTTER GRINDING



*Specify this*

## POPE

SUPER PRECISION, 1 HP, 3600 RPM  
MOTORIZED TOOL AND CUTTER GRINDER  
CLEARANCE ANGLE SWIVELLING HEAD WITH  
ANGULAR ADJUSTMENT IN A VERTICAL PLANE

*and get these seven savings:*

1. Strong, long lasting tool cutting edges because cup wheel cutter grinding can be used for practically all clearance angles.
2. Tooth rest stays on the center line of the cutter for practically all grinding on centers or in the work head.
3. A single set-up grinds most cutters and reamers all over, using the swivelling table and Pope tilting head.
4. No more mistakes on clearance angles. They read directly in degrees from the scale provided on the head.
5. No more trouble or time wasted getting the right clearance angle on the tough ones such as slab mills, **taper reamers**, angular cutters and form tools.
6. No more heat checking of cutters. One safe speed — 3600 RPM — for all wheels generally used on cutter grinders.
7. Quick, easy adjustment saves you time and money every time you grind a tool.

Ask us to send you complete  
specifications including  
price and delivery.

No. 118

## POPE®

ENGINEERS AND BUILDS STANDARD AND SPECIAL  
PRECISION ANTI-FRICTION BEARING SPINDLES  
FOR EVERY PURPOSE

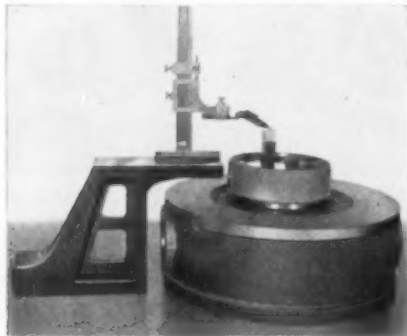
POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

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## Extension Height Block

The extension height block makes it possible to move inspection equipment (height gage and indicator, for example) closer to the workpiece, eliminating excessive extension arm lengths. This gives better control of measuring devices and allows more accurate measurements in hard-to-reach places.



Height is 10",  $\pm$  or  $-.0005$ ".

The block's over-all height is 10",  $\pm$  or  $-.0005$ . Ample clamping surfaces are provided. Sizes in addition to the standard 10" model are also available.

Machine Products Corp., 6771 McNichols Rd., Detroit 12, Mich.

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"See if you can find out how he can keep smiling on the money we pay him."



## THINK of it!

NOW you can have a boring head that will **BORE, FACE, TURN** and **GROOVE** at no higher cost than you would pay for an ordinary, single purpose boring head.

**THINK** this over before buying that new head!

Models for Any Size Machine

Write today for full details

**CHANDLER TOOL COMPANY**

MUNCIE, INDIANA

A Boring Head  
That Won't Face  
is NOT Complete



Model  
"D"

COMBINED BORING & FACING TOOL HEADS  
**Chandler-Duplex**

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# NOW...index tables

FOR MORE  
ECONOMICAL  
PRODUCTION  
ON THESE NEW

## **HANNIFIN**

"FD" PRESSES

Heavy-duty open-gap production presses with Hannifin hydraulic index tables...

*Available in all of these sizes:*

2, 3, 4, 5 and 6-ton bench models  
6, 8, 10, 12 and 15-ton floor models



### WITH THESE FEATURES...

- Dual Safety Hand Lever Controls
- Dual Electric Push-Button Controls
- Adjustable Stroke Control
- Reverse on Pressure or Distance
- Full Automatic Cycling
- Hannifin High Speed Hydraulic Index Tables
- Reciprocating Hydraulic Slide Feeds

### USE THEM FOR...

- Assembly Operations
- Riveting — Staking
- Forming — Stamping
- Trimming Die Castings
- Trimming Plastics
- Molding Semi-Conductors
- Preformed — Compacting

Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132. It tells the whole story.

## **HANNIFIN COMPANY**

529 South Wolf Road • Des Plaines, Illinois

— A DIVISION OF PARKER-HANNIFIN CORPORATION —

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This  
**THRIFTMASTER**  
 Fixed Center  
**DRILLHEAD**

**does 27 jobs  
 in 1 fast operation!**

Get maximum production—use Thriftmaster designed and built Fixed Center Drillheads

- Full ball bearing construction
- Fully hardened chrome-moly steel gears, spindles and drives
- All sizes, any number of spindles
- All types, including angular, rotating and lead screw
- For drilling, tapping, reaming, boring and milling
- Guaranteed performance backed by over 25 years of engineering and production experience

Also Full Ball Bearing Universal Joint, Single and Double Eccentric Adjustable Drillheads and Dorman Tappers.

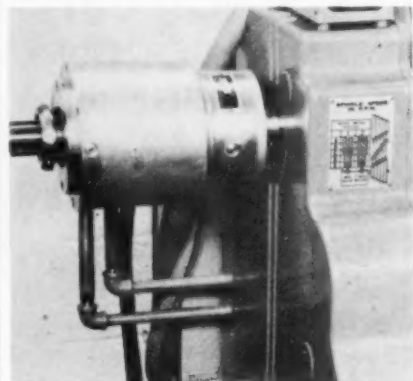
Write, wire or phone for complete information today.



1030 N. Plum Street      Lancaster, Pennsylvania  
 Use postpaid card. Circle No. 365

## Chuck Actuator Operates Air Chucks and Collets

The PowerGrip chuck actuator, used to close a chuck or collet on a machine tool, eliminates the need for a rotating union and provides power for holding either bar or chucking work. Air leaks



**Smallest actuator, Model 2B, mounted on a semi-automatic lathe.**

and vibration are eliminated, and down-time for repairs is said to be reduced.

The unit is adaptable to automatic operation. When combined with automatic work loading and unloading devices, it can eliminate the need for an operator.

The chuck actuator is a non-rotating air or hydraulic cylinder mounted on ball bearings. The cylinder's thrust is transmitted through the bearings to the machine's rotating spindle and draw tube. There is no flywheel effect, no limit on spindle speeds, and no delicate rotating air seal to heat up and leak.

The actuators are made in several standard sizes, from 4¾" to 12" piston diameter, and in other sizes to meet special requirements.

PowerGrip, Inc., Rockfall, Conn.

Use postpaid card. Circle No. 102

**NEW!**

# LARGER CAPACITY (6" WHEEL) PROFILE GRINDER

by Boyar-Schultz

## For Heavier and Larger Work

Long known as a time saver in Tool & Die Shops, Boyar-Schultz No. 2 Profile Grinder is now available in a new larger capacity size.

With its 6-inch diameter wheel capacity this new Profile Grinder will finish large dies and other similar contour grinding with the rapid efficiency so well known in the smaller wheel capacity models.

The new size is made in the Single Spindle model, with a bigger table to accommodate larger and heavier work. Also available with Standard Upper Spindle.



With Dual Spindle



With Dust Collector

**BOYAR-SCHULTZ**  
CORPORATION

2008 South 25th Avenue, Dept. A-K • Broadview, Illinois

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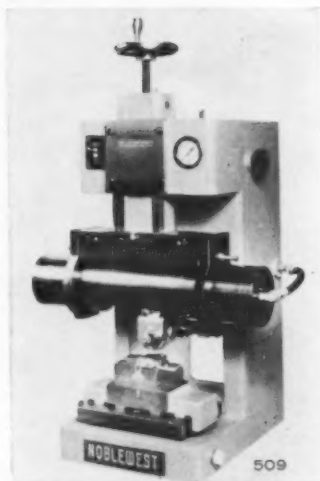


## Pneumatic Marking

Model 509 is a versatile and compact bench model marking machine with all-pneumatic operation for marking round, flat, or irregular pieces.

Equipped with Duomatic air head, this machine is said to be comparable to an air or hydraulic press with characteristic vertical ram travel, which provides the marking pressure. Depth of mark is controlled by air pressure preset at the regulator. Incorporated in the air head is an air-operated die slide which accommodates the roll marking tools and travels laterally to perform the marking operation.

Parts are placed on the work table and a hand or foot control is depressed to initiate the machine cycle, which is as follows: Pressure ram descends and applies marking pressure; die slide travels from right to left to roll in the mark; ram retracts; die slide returns and marking operation is complete.

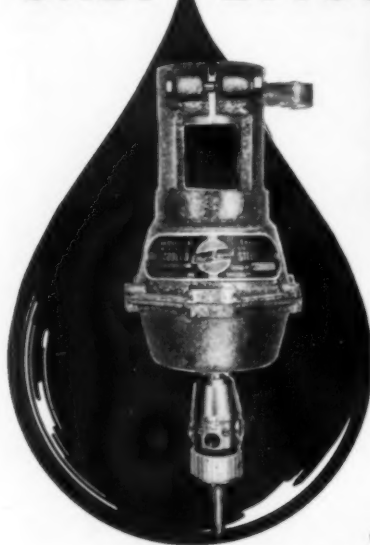


Vertical ram travel provides the marking pressure.

Noble & Westbrook Mfg. Co., Westbrook St., East Hartford 8, Conn.

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**When you "Put it on the Blanchard"**  
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Your Blanchard Surface Grinder is designed to give you peak production and economy on hundreds of different grinding jobs. But, for every job you run, *there's one particular wheel that does it best!* That's why Blanchard manufactures and stocks a wide variety of silicate, resinoid and vitrified bonded wheels and segments.

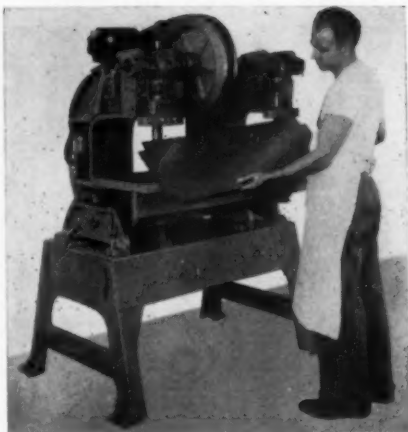
Your Blanchard representative will be glad to help you select the wheel—or wheels—best suited to your grinding operations. Call or write him today. May we send you a copy of "The Art of Blanchard Surface Grinding" (4th Edition)?

**THE BLANCHARD**  **MACHINE COMPANY**  
64 State Street Cambridge 39, Mass., U. S. A.

## Double Punch Press

The Mark II-C is claimed to perform punch press operations which normally require heavier and more expensive presses to cover the wide area requirements. This machine consists of two 5-ton, 12 $\frac{3}{4}$ " deep throat punch presses, permitting punching to center of 25" width material and up to 60" in length. It employs the use of the new Cyclo-Safe roller clutch, which affords central drive between the two presses, thereby eliminating torsional twist to the crankshaft and allowing synchronization of the rams and even distribution of power throughout the entire area of the machine.

The clutch can be operated manually or electrically and can be furnished with positive 2-hand control, assuring safety to the operator. Precise timing of the clutch permits synchronization with auxiliary equipment.



Mark II-C performs heavier press operations.

Kenco Manufacturing Co., 5211 Telegraph Rd., Los Angeles 22 Calif.

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- ... up to 3 HP in a 6" Frame ..  
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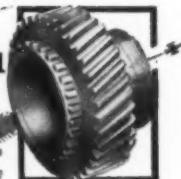


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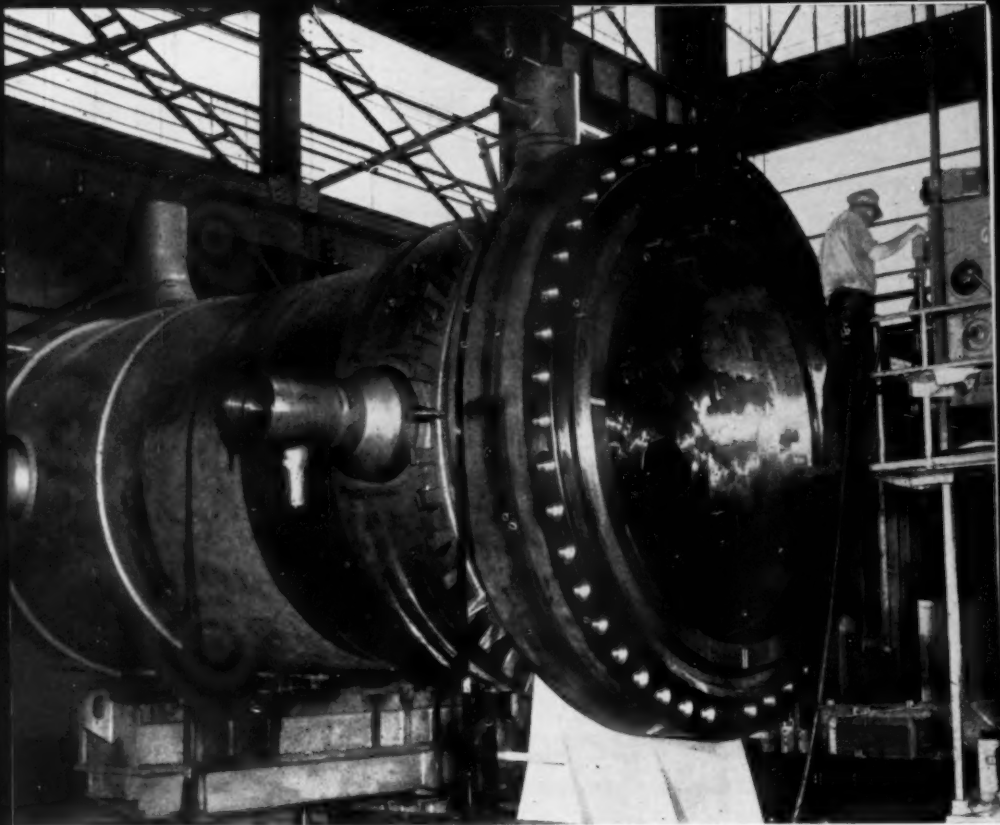
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CUSTOM MADE PRECISION GEARS SINCE 1947



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Courtesy Combustion Engineering, Inc.

## Combustion Engineering specified more than "ordinary boring mills"

Combustion Engineering, Inc., pioneer manufacturer of heavy reactor vessels, concluded that ordinary boring mills would not produce the close tolerances and surface finish required in their critical operations. That is why they specified a Cincinnati Gilbert floor type boring mill for this job.

The workpiece is a 96-ton stainless steel reactor for a Naval nuclear power plant. The Gilbert machine is used to finish the boring of the bolt holes in the 20" thick flange, and to machine the outlet nozzles.

Combustion Engineering's high standards require

a surface finish of 32 R.M.S. on some of the bolt holes—an easy specification for a Gilbert, which can bore holes with a mirror finish, when required. A Tele-Vernier optical measuring system increases the speed and accuracy of machine positioning.

Work of equally high quality is produced on a number of other Gilbert boring mills at Combustion Engineering's Chattanooga and Windsor plants—proof that "those who buy Gilbert buy Gilbert again."

Write for new Bulletin 558.

The Cincinnati Gilbert Machine Tool Co., 3366 Beekman Street, Cincinnati 23, Ohio.



Ask for free catalog 558

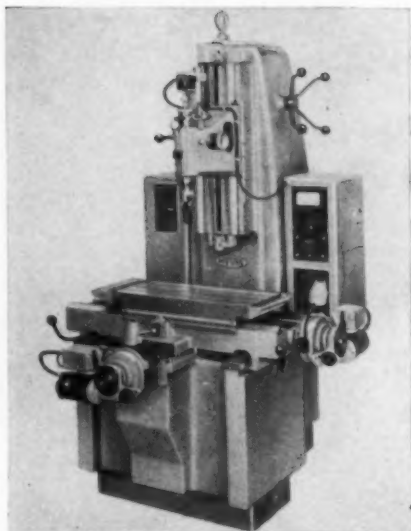
# GILBERT

## Measuring Machine

The Moore universal measuring machine provides motorized table positioning with accurate horizontal and cross lead screws. The motorized lead screw drive, illustrated in the photograph, is offered as optional equipment. The machine is reported to measure to one-third of a tenth.

A work capacity of 11"x18" and 18" in height, choice of an electronic indicator supported on a rotatable spindle, or a universal microscope for pickup are features of the machine. When used in combination with the Moore ultra-precise rotary table, the measuring machine provides angular positioning accuracy compatible with the coordinate positioning accuracy of the machine table.

For longitudinal travel, the greatest error in any inch is 15 millionths; in 18", 35 millionths, the manufacturer reports. In the cross travel, the greatest error in any inch is 15 millionths; in 11", 35 millionths.



Measures to one-third of a tenth.

Moore Special Tool Co., Inc., 800 Union Ave., Bridgeport 7, Conn.

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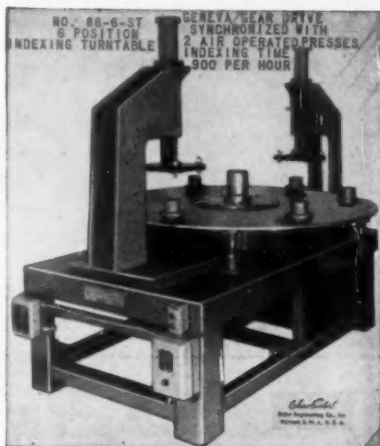
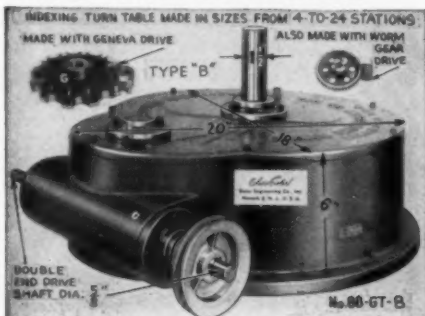
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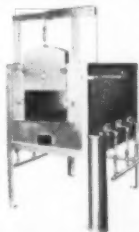
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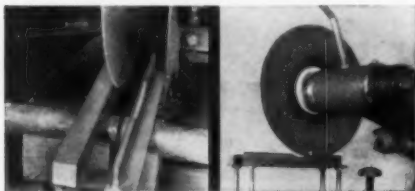
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Straight cuts in a few seconds. Two ends machined smooth as each cut is made. In many cases no further machining is needed. Figure your savings!



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Supporting and clamping the material on both sides of the cut (left photo, below) assures smooth, precision results in straight or mitered cuts. Wallace mounts the abrasive cutting wheel on a precision-ground, massively proportioned spindle (right photo) that stays accurate under conditions far more severe than normal service brings.



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Tell Joe Wheeler where to send your copy. Discuss your cutting need. We pay for the call.

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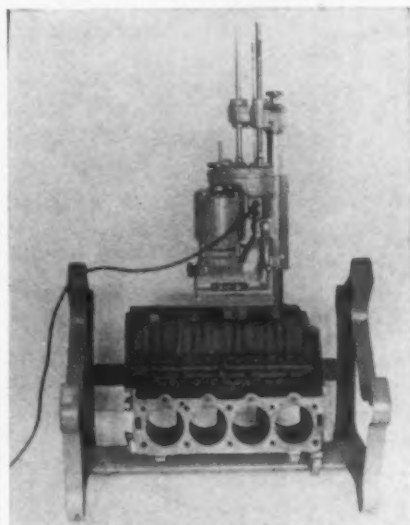
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## Boring Plate Bores All Angle Blocks

The Model No. 701 boring plate has been designed to bore all angle blocks and may be easily used with the boring



Model 701 boring plate, Model 601 boring stand.

stand illustrated. It claims to bore all angle blocks—regardless of angle and with no additional equipment necessary.

The Model No. 601 universal boring stand for V-8 blocks permits reboring of both banks of cylinders simply by rolling over the block.

Storm-Vulcan, Inc., Dallas, Tex.

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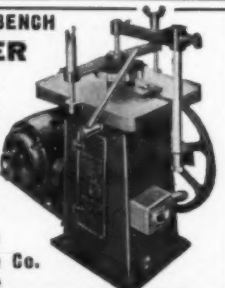
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3 3/4" stroke; adaptable for other work.

Low first cost, prompt delivery.

Good dealers wanted  
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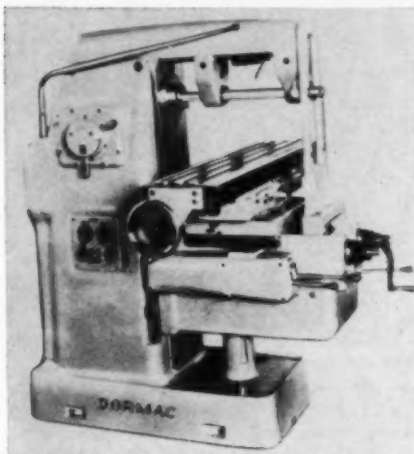
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MACHINE and TOOL BLUE BOOK



## Dial Type Milling Machine Provides 12 Speeds & Feeds

The Dormac high speed, dial type, universal milling machine features hardened and ground gears, hardened



Power feeds, rapid traverse in all directions.

and ground spindle, power feeds and power rapid traverse in all directions, National standard spindle, and climb milling arrangement as standard equipment.

The major specifications include: table sizes either 12"x51" or 12"x60"; No. 50 National standard taper spindle; 12 speeds, 27 to 1540 rpm, and 12 feeds.

Index Industrial Corp., 150 Broadway, New York 38, N.Y.

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June, 1959

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MODEL JA  
 56,000 R.P.M.

**\$60.00**  
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Weight 12 ounces;  
 length 6 1/4 inches;  
 chuck size 1/4 inch.  
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**THE SPEED** of Kipp Featherweight Air Grinders stays up where it belongs, under load, for efficient grinding even with small wheels. This may not be true with most of the "Plug-In" grinders you now are using.

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## Machine Mechanizes Hand Lapping Technique

The Spiralap line of flat lapping machines is designed to eliminate the work of hand lapping while providing extreme precision on flat work surfaces. A mechanic can productively generate lapping accuracy within one light band (.0000116") on this equipment.

Quality control is maintained through the ability of the machine to relap its



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## THE COLLIS CO.

DEPT. A, CLINTON, IOWA  
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**SPL-9A** bench model (\$795) has a 9" plate.

own plates. In reconditioning the plates, the Spiralap mechanizes the hand lapping method of having three laps of identical size lapped one to the other in sequence. This technique eliminates the need for conditioning rings.

In actual practice, only the plate on the machine is lapped with the successive plate when reconditioning is necessary, inasmuch as the three plates supplied with each machine are lapped and mated at the factory. The relap procedure takes only a few minutes and is claimed to assure a plane surface as true as one lapped by hand.

The machine offers a combination of: a lapping plate with a spiral groove filled with abrasive compound; two (or more) adjustable work locating arms to effect rotation of the work-piece by the lap, and two timers to control the work cycle and to total the use-time of the lapping plates between conditionings.

As the plate rotates, a steady supply of compound moves between the work-piece and the plates, inducing consistent abrading action.

Micromatic Hone Corp., Detroit, Mich.

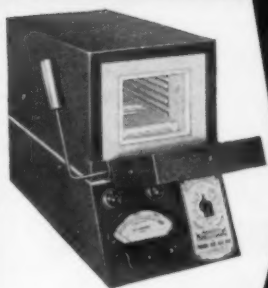
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439DL	4 1/4"	3 3/8"	9"	300°—1600° F.	1650	120.00
436DL	4 3/8"	3 1/2"	6"	300°—1900° F.	1650	130.00
5DL	4 3/8"	3 1/2"	9"	300°—1900° F.	1750	176.00
9DL	6"	6"	6"	300°—1900° F.	2200	200.00
669DL	6"	6"	9"	300°—1900° F.	3000	248.00
10DL	8"	4"	6"	300°—1900° F.	2000	220.00
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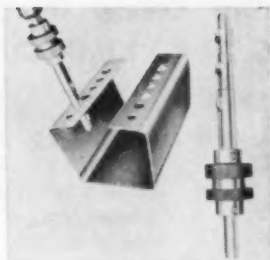
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## Tool Deburrs Three Hole Sizes

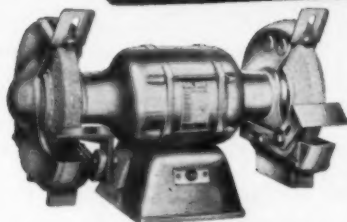
This special tool solved the problem of precision deburring both sides of three different sized holes in a vital missile launcher part. The tool has three separate pilot diameters and a cutter blade with three correspondingly positioned cutting heads. It is used in a portable drill-motor and deburrs the front and back hole faces of all the holes without separate tool changes. Nobur Mfg. Co., North Hollywood, Calif.

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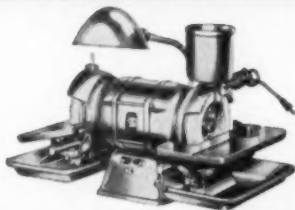
Cutter blade has three heads.

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S-824 socket set in new carrying case.

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The carrying handle is securely fastened to the pyramid designed cover. A locking hasp holds the contents securely.

The Billings and Spencer Co., Hartford 1, Conn.

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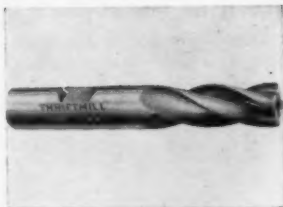


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Cutting Tool Div., Brown & Sharpe Mfg. Co., Providence 1, R.I.

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6 sizes, 1/8" to 1/2".

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The TIG model Idealarc welder, for tungsten inert gas welding, also can be used for conventional metallic arc weld-



Can also be used for metallic arc welding

ing. The machine is available in the NEMA rated 300 ampere size either as a straight AC transformer welder or as a combination AC and DC rectifier welder.

Optional features that may be added to either the AC or AC/DC type of welder include: a high frequency kit complete with controls for water, gas and high frequency arc intensity; remote hand or foot control for adjusting amperage to fill craters or compensate for variations in the joint; a DC filter to eliminate DC created in the arc when welding with AC and high frequency; a line contactor (starter) with overload protection; power factor correction condensers.

Lincoln Electric Co., Cleveland 17.

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The Easy Way rapid traverse for Bridgeport mills is designed to take the hard work out of raising and lowering the table—10½" a minute at the flip of a switch. Its many advantages over hand cranking serve to speed up the work and improve worker morale.

The most important use, of course, is for setup. While the motor effortlessly raises the table to the height desired, the operator can be changing cutters, putting on the vise, or making other preparations.

Capacity is 500 lb. The unit has a hand crank for fine adjustments. Auto-

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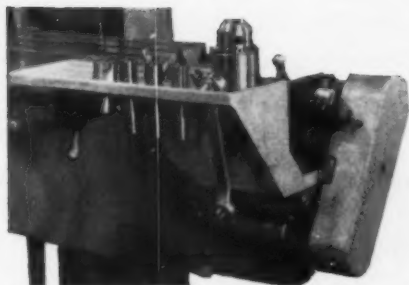
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J. L. LUCAS & SON, Inc.  
BRIDGEPORT 5, CONNECTICUT

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MACHINE and TOOL BLUE BOOK



**Raises or lowers table 10½" per minute.**

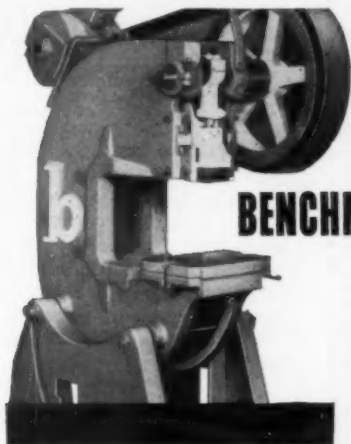
matic clutch disconnects motor when hand cranking.

Horton Machine Works, 868 N. Prior Ave., St. Paul 4, Minn.

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## **Angle Gage For Bending Pipe and Conduit**

The No. 1802 angle bending gage, for bending pipe and conduit, features a special notched protractor design, which is reported to allow the exact degree



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**...the small press that does BIG press jobs!**

There's no matching Benchmaster variety and versatility. For example,

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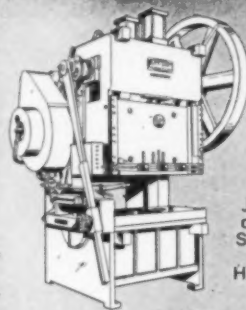


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**During bending operations**, gage can be placed on the frame for easy checking and reference.

of bend to be locked in. Its length is 70½".

The gage has three uses: Determining the degree of bend needed is simplified by setting the protractor to the angle desired and locking it in position. During the bending operation, the gage can be placed on the frame for easy checking and reference. After the bend is completed, the gage can be used to check the angle for accuracy.

**Greenlee Tool Co.**, 2136 12th St., Rockford, Ill.

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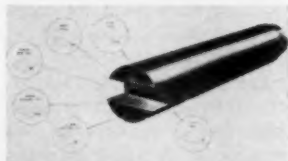


"Now, sir, let me demonstrate what a fine cutting edge these hacksaw blades have!"

## Boring Bar has Two-Piece Draw Bar Construction

Two-piece draw bar construction prestresses this boring bar, eliminating the normal deflection that takes place in application. Bar is claimed to be more rigid, stronger, chatterfree. It eliminates high frequency vibration normally accompanying boring tough alloys and stainless steel. Recommended for bottom boring and internal threading. W. D. Allen Manufacturing Co., 566 W. Lake St., Chicago 6, Ill.

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**Rigid, stronger, chatterfree**

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**Tannewitz**  
HIGH SPEED BAND SAWS

**IS EXCEEDINGLY FAST,  
SMOOTH, INVOLVES SO  
LITTLE DOWN-DRAW  
THAT FORMED PARTS  
CAN READILY BE CUT  
WITHOUT ANY REST.**



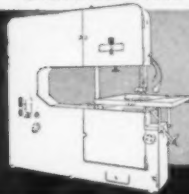
Tremendous time and cost savings, in cutting sheet steel, formed or flat, trimming malleable and steel castings and similar operations, are available to you with these machines.



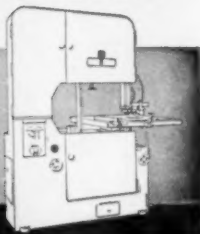
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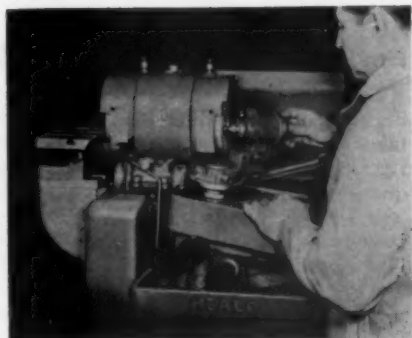
**SAWING MACHINERY SPECIALISTS**

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## Tool Sharpener Available in Two Designs

A new sharpening machine for metal cutting tools is now available in two designs. Model 3 for conventional elliptical tip tool grinding and Model 4 to handle either elliptical or true radius tip grinding. Both models are said to provide an economical, high precision means of grinding carbide tipped and high speed steel cutting tools. Fully automatic reciprocation assures uniform and repetitive tool tip accuracy and permits one operator to tend several machines at the same time. An offhand grinding attachment at the left end of the machine is standard equipment on both models.

The Model 4 machine's provision for true radius grinding provides greater accuracy where the tool is used in machining contoured shapes in which contact varies about the tool tip with the configuration of the workpiece. In true radius grinding on the Model 4, the



**Fully automatic reciprocation** assures uniform and repetitive tool tip accuracy.

clearance angle is obtained by setting the axis of tool holder oscillation at the desired angle, thus generating a conical surface. As a result, in contour boring or turning, the clearance angle and the tool tip radius remain constant although the cutting point moves about the tool tip. A tool holder for conventional elliptical tip sharpening is supplied with each Model 4 machine.

Where such tool geometry is not required and where tool contact with the work remains at a given point, the Model 3 tool sharpening machine for elliptical point tools offers savings in initial cost. Basic machines are priced at \$4125 for the Model 4 and \$2900 for the Model 3.

The Heald Machine Co., 8 New Bond St., Worcester 6, Mass.

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**Large Precision Machining  
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**WE HAVE 22 JIG BORERS**

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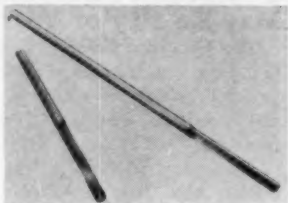
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MACHINE and TOOL BLUE BOOK

## Carbide Miniature Reamer Solves Small Hole Problems

A new type of solid carbide miniature reamer can be sized with accuracy to millionths in less than 15 minutes, the manufacturer claims. It is believed that the new reamer will solve many design problems which the drilling and sizing of holes 1/16" or less have presented. The reamer is offered in two sizes—1/16" and 1/32". Its design is said to provide greater rigidity. Microtron, Inc., 6 Manhasset Ave., Port Washington, N.Y.

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Two sizes—1/16" and 1/32"



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## 6" Abrasive Belt Machine May Be Dry or Wet Grinder

The Hammond 600-P 6" abrasive belt grinding machine is a low cost platen grinder which is claimed to have all the modern wet or dry grinding features.

As a dry model, it has an exhaust outlet. Also, this model can be equipped with a built-in DusKolektor.

As a wet model, the machine has a new style sprayer which provides a heavy lay of water on the belt and complete flooding of the work. The sprayer is adjustable to the work height. A curtain attached to the sprayer traps splash from the work and table. Work temperature is kept at a minimum. A hood and large pan provide effective spray and splash control. Wet grinding has the advantage of better finish, less heat and work distortion, less belt loading.

Belt tracking is outside the hood



Model 600-P wet abrasive belt grinder.

away from water and grit. The door is recessed for right angle work. A handy lever releases the spring belt tension for fast and easy belt changes. Quick change from vertical to horizontal position is made by loosening two screws. The steel platen is reversible top to bottom and front to back for maximum use. The pulleys are dynamically balanced for smooth operation and run on sealed ball bearings. The drive is V-belt.

On the dry model the DusKolektor is located in the floor stand, and so is the double-baffled coolant tank and pump on the wet model.

Hammond Machinery Builders, Inc.,  
1600 Douglas Ave., Kalamazoo, Mich.

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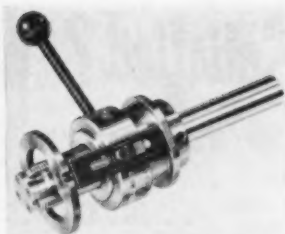
MACHINE and TOOL BLUE BOOK



## Threads Produced on Tough Materials

Class ST collapsing taps produce smooth threads on especially tough materials. They have a semi-taper action for tapping N.P.T. or N.P.T.F. pipe threads. Chasers recede during the tripping action, reducing cutting stress as the full threads are being formed. Stop-off lines are eliminated. The thread is produced by the jam-cut principle up to the point of tripping, then the semi-taper mechanism functions. Geometric-Horton, New Haven, Conn.

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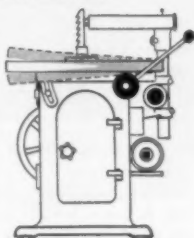
Jam-cut to point of tripping



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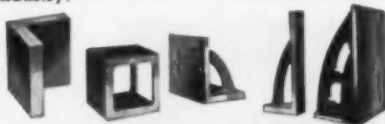
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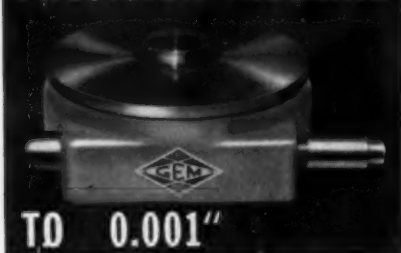
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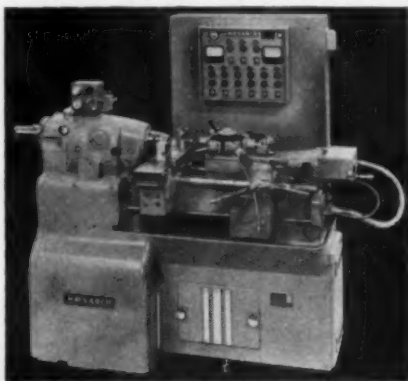
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13600 FORD ROAD  
DEARBORN, MICHIGAN

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## Hand Screw Machine

Higher output and greater accuracy with less operator effort are claimed to be performance characteristics of the Speedi-Matic, an improved Monarch hand screw machine. Recommended for lots ranging from less than 25 to more than 2500 pieces, it features simplified electronic controls and a hydraulically powered turret.

The control center provides preselected, automatic speed and feed change. A separate speed may be preset for



For lots ranging from 25 to 2500 pieces

each of the six turret positions (including a reverse speed for tap withdrawal) and for each of the two cut-off and forming slide positions. Speed range is infinitely variable from 40 to 4000 rpm; feed range, infinitely variable from 1/8" to 16" per minute. It is possible, consequently, to use the most efficient speed and feed for each operation.

Also included in the control center are a feed indicator, a dual rpm and sfpm indicator and a work diameter selector. The indicators enable the operator to select quickly the correct speed and feed for each work station. Use of the work diameter selector provides the ideal surface cutting speed without the usual calculations. Setup is so simple that the time is regained during

production of the first five or six pieces.

As the power feed, ram type turret is manually retracted, it is hydraulically indexed, then located in the new position to an accuracy of less than .0002" by a hydraulically actuated locating plunger and clamped in position hydraulically. Retraction of the turret farther than the index position permits manual rotation of the turret head. An easily set, adjustable, positive length stop for each turret position allows

quick setting for exact depth of cut. Working stroke of the turret is 5". The feed box is powered by an electronically controlled feed motor.

The self-centering cut-off and forming slide moves on preloaded anti-friction bearings and carries its own forced feed lubrication system. A uniform force applied to the operating lever results in a multiplication of force at the tool as it approaches center. Positive stops limit slide stroke in each

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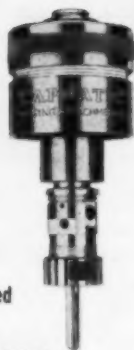
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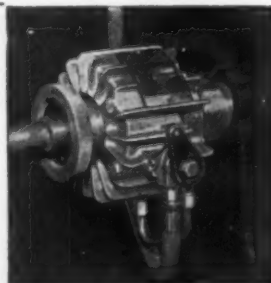
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**WILSON AIR COLLET CLOSER, INC.**  
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direction. Built-in speed control switches cause the spindle to run at the predetermined speed for each slide position.

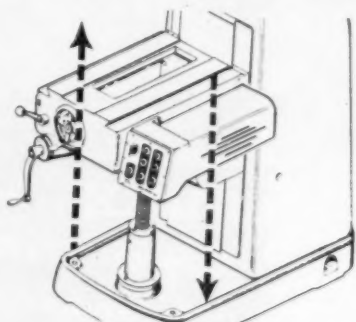
Drive to the spindle is from a 5 hp, dc motor. It is gearless, stepless and infinitely variable, both forward and reverse. Acceleration from 0 to 4000 rpm requires only two seconds; braking to a stop, only 1½ seconds. Either an air or a lever operated pusher type collet attachment may be used, both in connection with an air operated bar feed. Bar stock capacity is 7/8".

Monarch Machine Tool Co., Sidney, Ohio.

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### Milling Machine Knee Motorized

Famco Machine Co., 3100 Sheridan Rd., Kenosha, Wis., has added power feed to the knee on its 1½ hp and 2 hp



Power is applied to  
elevating screw with a  
feed range of 0.5"—10"  
per minute.

mills. This feature offers the operator greater milling convenience and a more precise method for deep precision boring without the possibility of tool run-out.

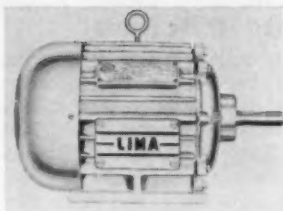
Power is applied to the elevating screw with an infinitely variable feed range between 0.5" and 10" per minute. The line now has power feed in three directions—table, saddle, and knee.

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## **Rerated NEMA TEFC 1-40 HP Motors**

Rerated NEMA Type E, totally enclosed, fan-cooled electric motors are for use in non-explosive atmospheres containing excessive moisture or abnormal quantities of dirt, metallic dust or other abrasives. They can be furnished for standard horizontal, wall or ceiling mount. All standard commercial frequencies and voltages below 600 v are available. The Lima Electric Motor Co., Inc., Dept. 140, Lima, Ohio.

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**Deep fins dissipate heat.**

*Even without pilots or finger stops . .*

## **"RFC" Automatic ROLL FEEDS\***

**control feeding to  
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Shift Feed Finger spring from one lug hook to opposite side

### **CAN'T SLIP**

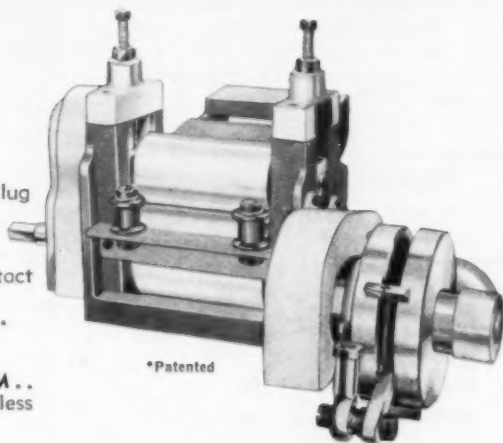
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### **PATENTED CLUTCH MECHANISM..**

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**IMPORTANT:** Please state make, type and tonnage of press when inquiring.



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**ASHTON, R. I.**

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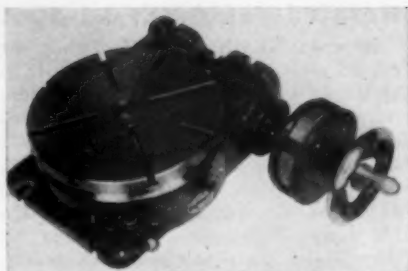
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## Rotary Table Reads to 1 Second

This 11-inch rotary table reads to 1 second and has an over-all performance accuracy of  $\pm 2$  seconds throughout the entire  $360^\circ$ . It is called the Model 2 Ultra-Precise rotary table. The manufacturer also offers a table which reads to 5 sec. and has an over-all accuracy of  $\pm 6$  sec.

More precise angular spacing is achieved on the Model 2 through the use of a non-disengageable, thread-ground worm in combination with the accurately spaced teeth of its mating gear.

A corrective lapping technique produces tooth spacing accuracy within less than  $\pm 2$  seconds. This lapping is done by an ultra-sensitive method of angular measurement—interferometric inspection and calibration. The interferometer employed for this purpose is accurate to 1/10 of a second of arc and uses interference bands of monochro-



**Accurate** in horizontal, vertical position

matic light as a means of angular measurement. Periodic and lead errors of the worm are also corrected to within less than  $\pm 1/4$  sec.

As a final operation to assure precise angular spacing, the worm and gear are burnished together to glaze and work-harden their perfectly matched contact surfaces. Since the worm is in permanent engagement, loss of accuracy resulting from repeated throwing in and out is eliminated.

Accurate in either horizontal or vertical position, this rotary table is recommended for precision spacing applications on jig borers and jig grinders. An additional vernier permits normal reading in the vertical position.

The hand-scraped steel table top runs parallel with the base within less than 0.0001". The conical surface below T-slots is graduated in degrees as an easy-to-read reference scale.

Moore Special Tool Co., Inc., Bridgeport 7, Conn.

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**"Jorgensen"  
and  
"Pony"**

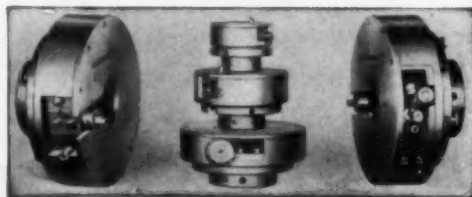



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Two-way Tool Feed—9, 12, 16, 20, 24, 30, 36, 40 and 48" sizes.

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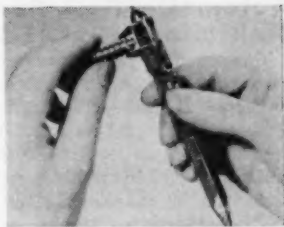
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The Fend-Truxa 111 with caliper is a chromium-plated writing and measuring instrument calibrated in inches and centimeters. It has a long-life ball point cartridge. Recommended for engineers, draftsmen. It is available with firm name or slogan for an advertising gift or premium. Individually gift-boxed with instructions. Price \$7.95 pp; 3 or more—\$6.45 ea.; 50 or more—\$3.99 ea. Designs Modern, 4082 El Bosque Dr., Pebble Beach, Calif.

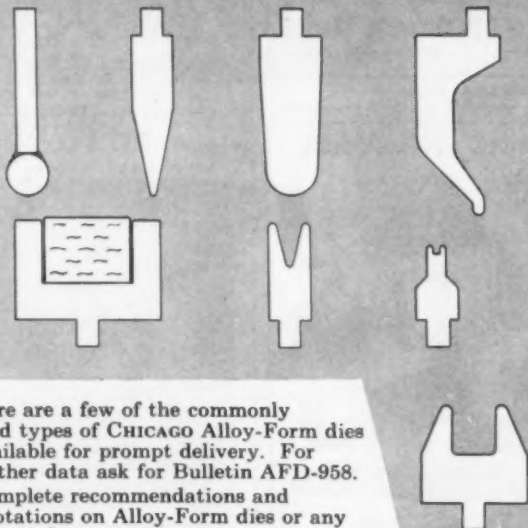
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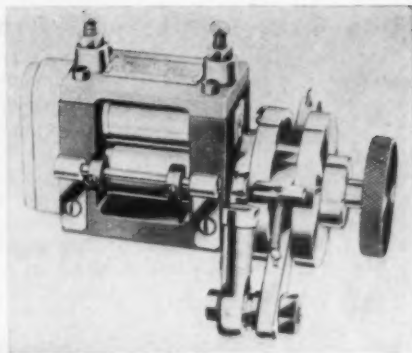
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## Automatic Roll Feeds Maintain Original Setting

Twenty-six new sizes have been added to the manufacturer's line of low-cost, trouble-free, automatic roll feeds for punch presses. A range of feed increments from 1" to 20" in length and up to 20" in width is now possible, with the 39 standard sizes.

These feeds, for side or rear feeding, will fit any light or heavy duty punch



Side or rear feeding for any punch press.

press. All attachments for installing are furnished.

The units are said to positively maintain their original setting regardless of use or wear.

Jaco Devices, Inc., 99 High St., Hingham, Mass.

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## TAP BUSHINGS

Drives all standard taps from No. 0 to 1 1/2" and pipe taps from 1/8" to 1". Five o.d. sizes.

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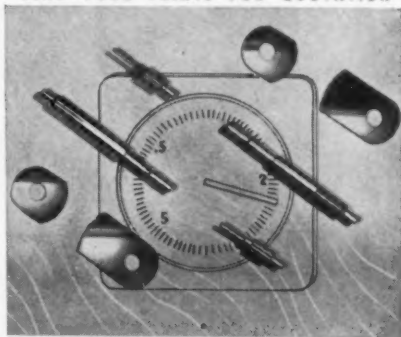
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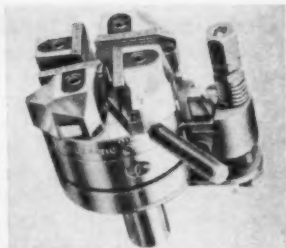
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MACHINE and TOOL BLUE BOOK

## "Push-Off"—"Pull-Off" Die Head

A new combination push-off—pull-off die head is available for Brown & Sharpe automatics, turret lathes, and other machines employing a stationary type die head. Designated as Type DE Landmatic, it replaces the EXX style which incorporated push-off (external) action only. The die head is available in two sizes, the No. 4 ( $\frac{1}{2}$ " ) with a No. 4 to  $\frac{1}{2}$ " range for application to No. 0, OG, 2 and 2G B&S machines, and the No. 5 ( $\frac{5}{8}$ " ) having No. 4 to  $\frac{5}{8}$ " range. Landis Machine Co., Waynesboro, Pa.

Use postpaid card. Circle No. 127



Internal or external opening.

Up To  
**10,000** psi Oil  
from  
**Shop Air!**

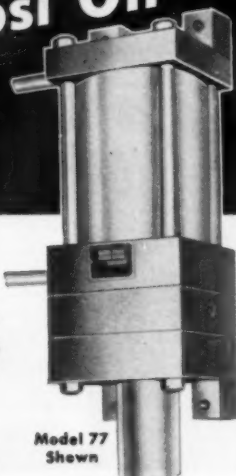


AIR TO  
HYDRAULIC

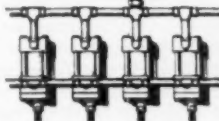
## BOOSTERS

**No Pumps or High Pressure  
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Hook a Miller Air-Hydraulic Booster to your air line and get INTENSIFIED (ratios up to 100 to 1) Hydraulic Power that you can vary and control at will and use for such common shop operations as punching, clamping, pressing, riveting, shearing, welding, crimping, testing, etc. High pressure booster output drives the hydraulic work cylinders and can be directly applied (without cylinders) in testing, measuring, other applications. Boosters save air, space, weight, require little or no maintenance, and hold pressure as long as desired without additional power consumption. Models for immediate delivery.



Model 77  
Shown



**Write For  
Full Details**



FLUID POWER DIVISION

Fick Reedy Corp.

7N022 York Rd., Bensenville, Illinois

## Bushings for Plastics

Recognizing the increasing use of plastics as a lightweight and inexpensive material for use in jigs and fixtures, Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, has introduced a new line of drill jig bushings for use in plastics. They are made of oil-hardening bearing steel. Two basic types of bushings for plastics will be stocked.

Trans-Lok bushings, for embedding in castable materials, have serrations in



Trans-Lok (l), Press-Lok (r)

a herringbone pattern around the outside diameter, with the opposed rows

## NEW! UNISORB LEVEL-RITE 200 Machinery Mount



Here's an all-purpose, self-contained leveling mount ideal for light plant equipment and heavier office machines. Provides simple, fast and secure mounting, and precise leveling . . . plus maximum vibration control. Use them on such equipment as . . .

- Duplicating machines
- Business computers and machines
- Laboratory instruments and test equipment
- Small lathes, drill presses, punch presses
- Air conditioning units
- Pumps and compressors

Model LR 200 is precision leveling device, handles loadings up to 200 lbs. per unit.

Try a set, NOW! Send for bulletin and details on Money-Back Trial Offer. Also prices on sets for quantity installation.

# UNISORB

Division of The FELTERS Company

208 South St.,  
Boston 11,  
Massachusetts

Use postpaid card. Circle No. 411

in the pattern separated by a groove. The deep transverse pattern and groove lock the bushing rigidly when it is embedded in the jig material. These bushings cannot be turned in either direction, nor pulled nor pushed out of the jig. Liner bushings, for use when the jig will outlast the bushing or when more than one operation (for example, drilling and reaming) is performed in

the hole, are also available in the Trans-Lok pattern. These liners are embedded in the plastic so that standard renewable bushings can be inserted in them to guide the drills and reamers.

Press-Lok bushings have straight serrations on the upper half of the outside diameter. This permits them to be pressed firmly into holes in plastic, wood, or other soft or ductile materials.

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## Quick, Economical, Precision Inspection!

Now, you can check intricate shapes such as complicated form tools in a hurry with an economical Covet Optical Comparator. It's priced at only \$985.00 to bring the advantages of precision optical inspection within the reach of every tool room and shop. With the No. 14 Comparator and a Covet Micro-Precision Grinder you've got a tool room team that can't be beat for accuracy.

**Only \$985**

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**GRINDERS**  
**BENTON HARBOR, MICHIGAN**

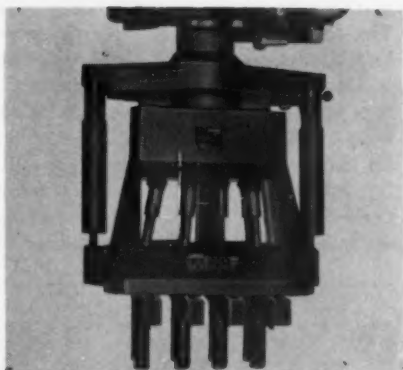
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Send for complete details on the Covet Optical Comparator. Ask for Bulletin BB-69.

## Attachment Adapts Heads to Radial Drilling Machines

Increased productivity in handling multiple-hole drilling operations on cumbersome parts is said to be effected by a new attachment for adapting large multiple-spindle drilling and tapping heads to radial drilling machines. The manufacturer, United States Drill Head Co., Cincinnati, Ohio, has combined an air counterbalance and 360 degree ball bearing swivel attachment for this purpose. Thus the company's universal joint adjustable multiple-spindle drill heads (as well as fixed center) can be added to any radial. The flexibility provided in the combination of the radial, the swivel and the universal joint head is said to reduce costs in drilling structural steel, tube sheets, flue sheets, condenser sheets, and other out-size parts.



**Eight-spindle drill head** shown mounted on a radial drill with the new attachment

The air counterbalance, which is available in various strokes, handles the entire weight of the head and the tools. Two cylinders are employed to



## ACME TAPS From Stock!

HIGH PRODUCTION TYPE

with Exclusive

"Lead Screw Pilot"

Improve Acme Tapping with Single Pass Acme Taps. Eliminate Shaved Threads, Improve Finish, Reduce Machining Time. No Lead Screw Required. Sizes  $\frac{3}{8}$ " to 6" diameter.

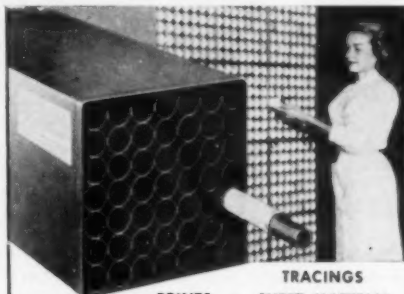
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**GAGES?** Cost less when ordered with tap

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## MULTIROLL FILES

Depth	11 $\frac{1}{4}$ "	22 $\frac{1}{4}$ "	30 $\frac{1}{2}$ "	36 $\frac{1}{2}$ "	42 $\frac{1}{4}$ "
49 Tube 1 $\frac{3}{4}$ " I.D.	49AB	49CD	4930	4936	4942
	\$7.50	\$9.50	\$12.80	\$13.80	\$14.80
MODEL					
25 Tube 2 $\frac{1}{4}$ " I.D.	25AB	25CD	2530	2536	2542
	\$7.00	\$9.00	\$11.80	\$12.80	\$13.80

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MACHINE and TOOL BLUE BOOK

maintain a balanced condition of the head on the machine. Because the air is controlled on both ends of the stroke, only sufficient pressure is maintained to counterbalance the weight of the head during all portions of the stroke. Thus, there is no build-up of pressures to affect the feed mechanism of the radial, as is the case with spring-loaded counterbalancing designs. On the return stroke, the air is also controlled

to prevent extreme, quick return, which could endanger the operator.

The 360 degree ball bearing swivel allows the spindles in the drill head to be aligned properly with the pattern of holes required in the part. Positive locking of the swivel when the head is in the aligned position is accomplished quickly by manipulating a lever, thus providing fast, accurate relocation of the head. Use postpaid card, Circle No. 129



**One hand moves it  
EASILY!**

**THE WELLS  
MODEL  
49A**

**"2 in 1" METAL CUTTING BAND SAW  
WITH WHEELS AND HANDLE  
(Optional Equipment)**

With heavy duty, rubber tired, ball bearing wheels and one piece fold-down handle, the Wells Model 49A is a metal cutting band saw that's REALLY MOBILE . . . and VERSATILE. Use the 49A as a horizontal cut-off machine (capacity  $3\frac{1}{2}$ " x 6") or swing the head to vertical position . . . it's an upright band saw.

The optional wheel and handle unit, available for new machines and those already in service, is a tremendous time and labor saver. Ask your local Wells Distributor for details . . . or write for Bulletin 253-H.



*The Pioneers of Horizontal*  
**METAL CUTTING  
BAND SAWS**  
WELLS MANUFACTURING CORPORATION

707 Coolidge Ave., Three Rivers, Michigan

Use postpaid card. Circle No. 415

## Layout Fluid In New Colors

A new range of colors has been made available to users of Dayton Rogers layout fluid. Besides purple No. 1, the standard layout fluid for general usage, the following colors may be ordered: (2) black; (3) white; (4) yellow; (5) red; (6) green; (7) brown; (8) orange. Unless colors and numbers



Free samples offered.

are specified when orders are placed, standard No. 1 purple will be supplied.

Free samples are being offered by the Dayton Rogers Mfg. Co., Minneapolis 7, Minn.

Use postpaid card, Circle No. 130

## Unit-Type Tapping Machine Handles 1215 Lock Nuts/Hr.

Completely automatic tapping operation is offered by unit-type tapping machine Model 409-S. Designed to process  $\frac{1}{2}$ " electrical conduit lock nuts, the four-spindle machine selects, positions, loads, taps and ejects 1215 pieces per hour at 80% efficiency. Units are also available for  $\frac{3}{4}$ ", 1",  $1\frac{1}{4}$ ",  $1\frac{1}{2}$ " and 2" size lock nuts.

The machine consists of a vertically mounted four-spindle individual lead screw tapping unit, two motorized hoppers and feed mechanisms, and four fixtures, all mounted on a common cast iron base with a platen face machined on top. These components are lubricated automatically with an oil mist lubricating system.

The fixtures are fed by four tracks, two originating from each hopper, and are automatically operated. Parts are

## Hand Operated Cutters



Made in three  
sizes: A, B, and C  
for cutting  
**ANGLES**  
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**FLAT BARS**  
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**WIRE ROPE**

(change cutter type, by  
changing blades)

The compound lever construction of these cutters makes them much easier to operate than cutters of equal-rated capacity with direct pull action.

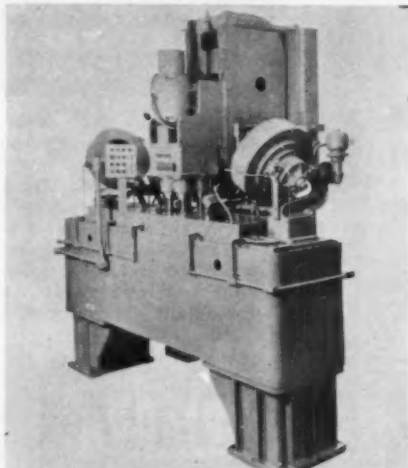
Catalog sheets on request covering our complete line of metalworking tools.

**T. H. LEWTHWAITE MACHINE CO.**

312 East 47th St.

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Machine consists of a four-spindle tapping unit, two hoppers, four fixtures, on base.



oriented so that they arrive with concave side down. This assures that any burr is left on the concave side when the lock nuts are tapped.

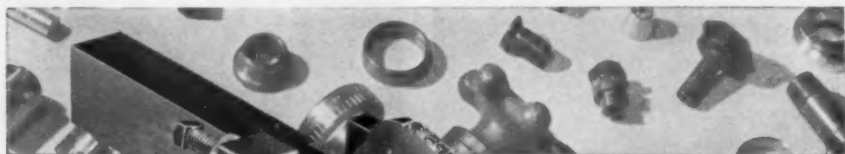
The parts are transferred to the work holding fixtures by an air operated shuttle mechanism. As the parts enter the fixture, cog-like guide rails orient the lock nuts on their lugs for proper positioning. The parts are secured in position by an air operated equalized

clamping mechanism which is actuated electrically when the shuttle has correctly positioned the parts.

Cycle time is approximately 9.5 seconds, based on operating the taps at 35 surface feet per minute. After the unit is cycled, the part is automatically unclamped and ejected directly to a tote basket as the unit retracts.

Morris Machine Tool Co., 2011 Eastern Ave., Cincinnati 2, Ohio.

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**CUT THOSE  
EXTRA COSTS  
THE  
New Method  
WAY!**

NM Model 500-C  
Automatic Roll Marker

## **DO YOU USE SEPARATE SETUPS FOR STANDARD AUTOMATIC OD MARKING?**

### **Other New Method Automatic Marker Models**

NM Model 700—the cut-off marker for custom OD marking.

NM Model 900—Super automatic roll marker for most types of radial end-face marking.

NM Model 600-E—for end-face marking.

★ There's a New Method automatic marker for most marking and identifying requirements, each designed for a specific need.

★ New Method also manufactures a complete line of manually operated marking devices.



SINCE 1931

### **Advantages of Model 500-C**

- Eliminates need for separate setups
- Provides easy die change
- Automatic reset
- Adjustable stop for accurate starting position
- Assures uniform depth of impressions on parts
- Drag or scoring of part prevented by starting pad guards

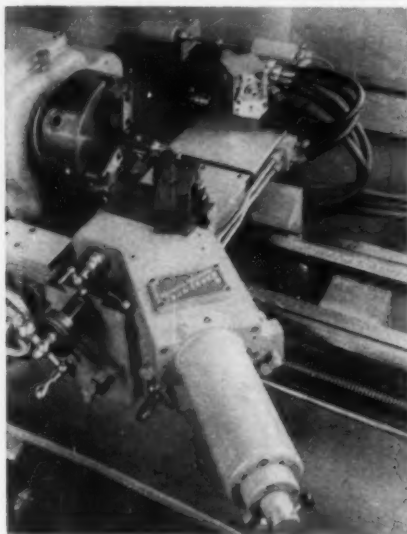
★ Write TODAY for 500-C brochure

**NEW METHOD STEEL STAMPS, INC.**  
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## Lathe Trace Attachment

Based on the precision True-Trace hydraulic 180 deg. single dimension tracer, the attachment is adaptable to



For performing step shaft tracing, contour turning and facing operations.

virtually all makes of lathes. It converts standard lathes to contour machines.

Featured are new Meehanite cross and tool slides finished to precision tolerances.

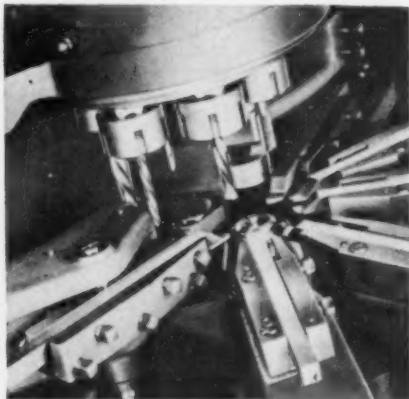
True-Trace Sales Corp., 9830 East Rush St., El Monte 50, Calif.

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## Swiss Type Automatics

The Arthur Loeffel Co. Inc., Merrick, N.Y., has announced that it is the U.S. distributor of Petermann Swiss automatic screw machines.

Features of this machine include: six- or four-spindle turrets with fast index-



Spindles can be used equally well for drilling, tapping, or external threading.

ing; micro differential micrometers; plan-lever flat cam headstock advance; built-in gear box for both feed and spindle-speed settings; headstock with Nadella needle bearings; electronic cam shaft variator; fully automatic lubrication.

Capacities are:  $\frac{1}{8}$ ",  $\frac{5}{32}$ ",  $\frac{25}{64}$ ",  $\frac{5}{8}$ ",  $\frac{3}{4}$ ", 1- $\frac{1}{16}$ ".

Use postpaid card. Circle No. 133

 <b>Plain Type</b>	 <b>TRADE MARK</b>	 <b>Offset Type</b>
<h1 style="margin: 0;">CONTINUOUS HINGES</h1>		
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">OPEN</p> <p style="font-size: small;">All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.</p>	<p><b>AUTO MOULDING &amp; MFG. CO.</b>  <b>1110 E. 87TH ST.</b>  <b>CHICAGO 19, ILL.</b></p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">OPEN</p>
 <b>THREE-FOURTHS OFFSET</b>	<p><b>SPECIFICATIONS</b>              Open width <math>\frac{7}{8}</math>" to 6"              Gage Material .040 to .125              Pin Diameter .101 to <math>\frac{3}{16}</math>"              Lengths to 120"</p>	 <b>SEMI-OFFSET</b>
<p>Use postpaid card. Circle No. 418</p>		

## Drilling Machine Drills To Center of a 11-3/4" Circle

The Model AF-7B high speed sensitive drilling machine has a capacity of No. 0-5/16" diameter drills and can



Machine has capacity of No. 0-5/16" drills. drill to the center of a 11 3/4" circle.

Vertical travel of the head is 8". The head can be moved through a complete circle if desired. Spindle travel is 2 3/8".

The machine's speeds are 750, 1500, 3000, and 6000 rpm.

High Speed Hammer Co., 313 Norton St., Rochester 21, N.Y.

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## CAMS

To Your Specifications  
except Screw Machine Cams

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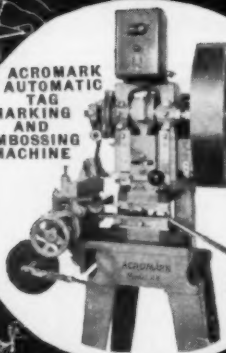
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25 LOCUST AVE. ROSELAND, N.J.

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June, 1959

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and selects  
changes of  
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by moving  
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251

## Angle Block Set

For compound angles, this set of angle blocks can be used crosswise, lengthwise, or at any angle to the backrail of a magnetic chuck. Any angle from 1 to 90 degrees (by degrees) can be ground. Only a few seconds are required to set up an angle.

The square steel pins are said to transmit almost all of the magnetism from any magnetic chuck to the sur-



Use at any angle to backrail of chuck. face of the magnetic block that holds the work. Pins will not loosen in grinding use.

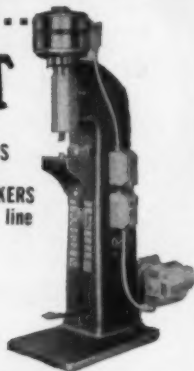
Glover Mfg. Co., 422 Park Ave., Meadville, Pa.

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CE Station Bridgeport 5, Conn.

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PRECISION HOLE FINISHING  
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**Clark** "FINISHING BARS"  
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Aircraft wing and fuselage sheet metal cutouts are said to be laid out quickly and efficiently using Crown toolmakers' ink in Aerosol spray cans. There is no need for spray booths or specialized spraying equipment. Tedious hand application is eliminated—of particular interest in visual inspection of castings. The ink dries rapidly and holds sharp fine scribed lines. Crown Industrial Products Co., Dept. MEW, 1006 Amsterdam St., Woodstock, Ill.

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for Surface  
Inspection  
and  
Control



The

## MICROCORDER

The Microcorder draws magnified surface roughness profiles that show (1) *peak-to-peak spacing* and *peak-to-valley height* of roughness irregularities and (2) *width* and *depth* of pits, scratches, chatter marks and surface porosity. It is simple to operate, and is designed for use in shop or lab — on metals, paper, plastics, etc. — for any length of trace up to 2 3/4" on ID's, OD's and flats.

FREE BULLETIN LT138 gives specs. Write —



**MICROMETRICAL  
MANUFACTURING COMPANY**

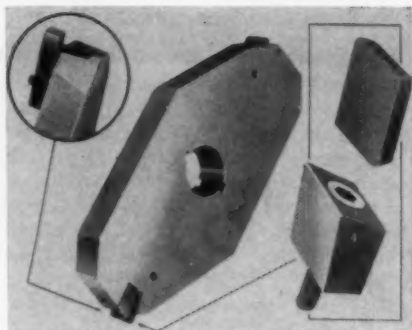
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A two station positive rake fly cutter is designed for skin and spar milling applications, particularly for aluminum forgings and castings.

Width of cut is controlled by a simple blade setting gage that locks on the side of cutter, permitting operator to set the blades in the exact position without removing cutter from spindle or disturbing setup.



Gage controls width of cut.

The cutter is said to be dynamically balanced and does not require rebalancing after indexing or replacing blades. In case of accident, the inexpensive wedges take the brunt of the damage and can be easily replaced without removing the cutters.

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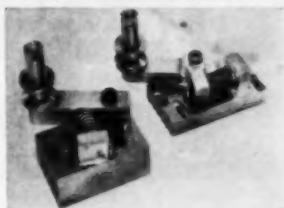
MACHINE and TOOL BLUE BOOK



## Compensator Holds Stock Taut as it Moves into Press

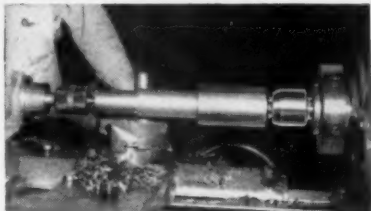
Stock guide compensator applies constant spring pressure to coil or strip stock as it is fed into the die; it is applicable to automatic stamping operations. Alternate designs are available to fit the individual application—it comes in both right or left hand units. The radius arms of both models are 4.5" long and give a 1.5" in-out movement to the guide roller. Compensator mounts on die shoe. Jolico Industries, Allen Park, Mich.

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Right or left hand units

## New "Driving Center" Introduces Faster Machining Techniques on Work Held Between Centers



### Eliminates Chucks and Clamps... Permits Full End-to-End Machining... "Loads" or "Unloads" without Stopping

Designed to increase both output and accuracy, the new Ideal Driving Center grips end face of work and eliminates need for chucks, dogs or other clamping devices . . . Work may be machined end-to-end without removal—usually can be loaded and unloaded without stopping . . . Rigid direct-drive action reduces backlash—prevents slippage—simplifies indexing on gear hobbles and mills . . . No preliminary machining needed; self-compensating pins grip and hold non-uniform work ends—even odd shaped pieces . . . 63 combinations fit maximum work diameters from  $\frac{7}{8}$ " to  $6\frac{3}{8}$ ", in Morse tapers 2 to 6. Larger sizes may be had as specials.

#### MAIL COUPON FOR COMPLETE DETAILS



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Please send me complete engineering data and selection chart for IDEAL Driving Centers.

Name .....

Company .....

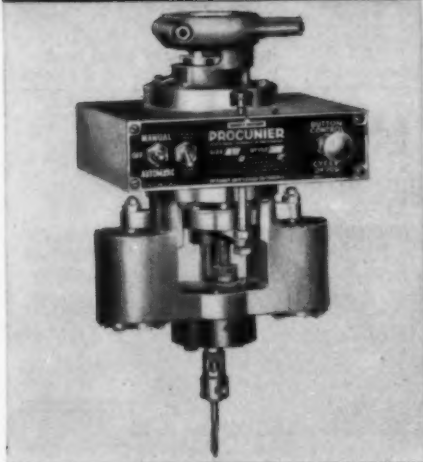
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### New Lead Screw Tapper

with Finger Tip Push Button Controls permits you to tap any quantity of practically any material, with absolute precision, without rejects, without stripped threads or distortion. Tests have shown it produces parts that pass 100% inspection—100% acceptable! The secret is in the tap control mechanism which feeds the tap automatically without any pressure. The Lead Screw controls the tap and guides it steadily through each cycle, guaranteeing supreme accuracy.

In addition, it offers convenient 5-way operation; pushbutton and foot control for complete cycle or jog automatic (without foot or hand controls) or with switch fixture for full cycle. Either way, you get uniformity, speed and precision that's unparalleled!

#### FREE BROCHURES

on the new lead screw push button unit and complete Procunier Tapping Head line are yours FREE. Write today!



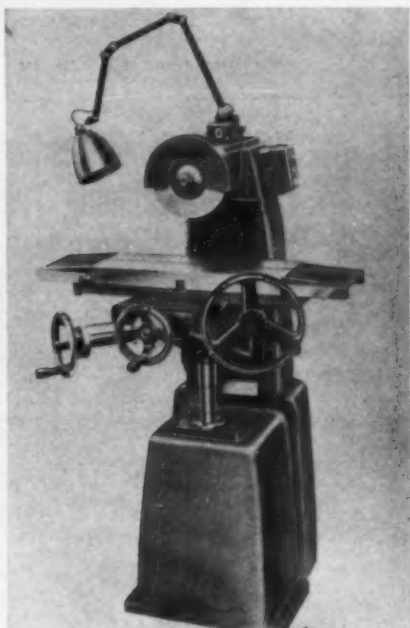
### PROCUNIER SAFETY CHUCK CO.

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### Horizontal Surface Grinder Is Quickly Set, Operated

The Eagle horizontal surface grinder is quickly set and operated and can be used for all surface grinding operations and for jigs, fixtures, press tools, cutters, etc.



Grinding cap., 15" x 6".

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#### HANDLES AND MOULDS

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### KITZMAN MFG. CO.

Manufacturers Of Lead Hammer Products

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MACHINE and TOOL BLUE BOOK

Vertical movement of the knee is operated by hand wheel through 2/1 ratio bevels, the movement being marked by .0005" graduations. The saddle is fitted with four oilwells for constant table lubrication. The table is hand operated by 7" handwheel through helical pinion and rack. The head runs in precision taper roller bearings, thus giving long and trouble-free bearing

life without the need for constant attention to lubrication, the manufacturer reports.

Specifications include: table size—over-all 32", effective, 18"x6"; wheel size, 7"x1½"; grinding cap., 15"x6"; spindle speed, 2,500 rpm; floor space, 50"x34".

Aaron Machinery Co., Inc., 45 Crosty St., New York 12, N.Y.

Use postpaid card. Circle No. 139

**FOR PEAK TOOL BIT  
PERFORMANCE  
PICK**



## SUPREME

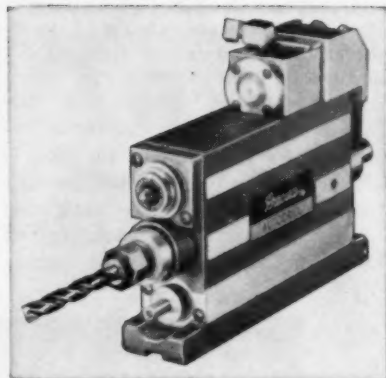
Use this unique steel for the very ultimate in cutting prowess. Highest hardness, highest wear resistance make **Vasco Supreme** the aristocrat of the shop when you want the most! Where production economics call for different bits, use **Neatro**, **Red Cut Superior**, **Red Cut Cobalt**—each a profit-maker in its range. *Write for Data Sheets.*

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## Smallest Air-Hydraulic Automatic Drill Unit

The Autodrill is an electrically actuated drill unit with fully automatic control and complete control of feed and stroke. It is only 2" wide, 12" long, and 7" high, not including motor, and can be mounted in any vertical or horizontal position on 2" centers. The unit develops three times line pressure in thrust and has a drilling capacity of



Drilling cap. 5/16" in steel, 1-1/2" stroke.

5/16" in steel and a 1 1/2" stroke. It also offers depth accuracy of .001" with no dwell required, and spindle speeds up to 6000 rpm, the manufacturer claims. Recommended motor sizes are 1/3 hp to 1/2 hp.

Other features include accurate drill

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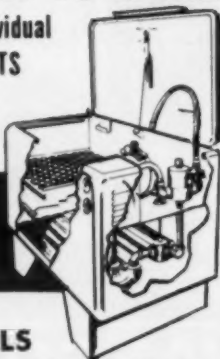
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500

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2. Flush chips and dirt from metal parts with filtered solvent
3. Clean out blind holes and cavities
4. Do it thoroughly, fast and safely

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GRAYMILLS CORP.

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The IMPROVED Compound Lever Shears

**ALL ALLOY  
FULLY  
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**Two Sizes**

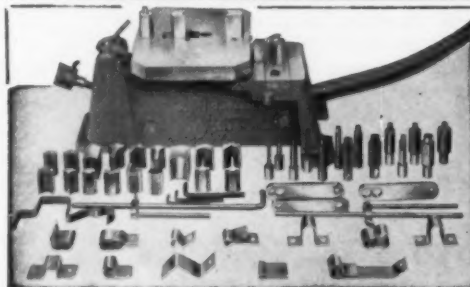


**PORTABLE**

No. 1 cuts up to No. 11 gauge strip or sheet.  
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## Multiform BENDER CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend, and cut round or flat brass, bronze, aluminum, steel, etc., up to 1/6"x1 1/2" as illustrated, other models up to 1/2"x8".

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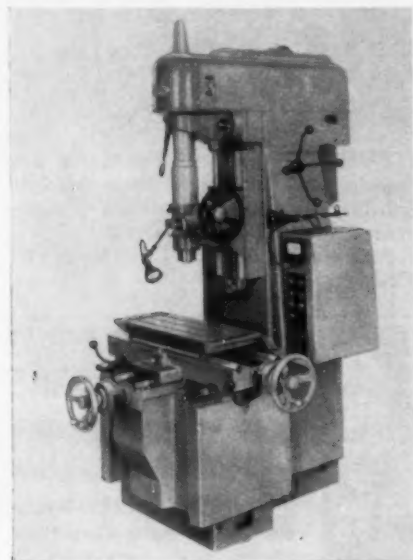
chuck, positive depth control, adjustable rapid traverse, and continuously variable hydraulic infeed.

Precise Products Corp., Racine, Wis.

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### Jig Borer Bores Holes to Less Than a Tenth

The Model No. 3 precision jig borer has a greater range and larger table than its No. 1 and No. 2 predecessors—11"x24"x20-13/16" height. It includes



A wide speed range, 60-2250 rpm.

the Moore features of accurate lead screws.

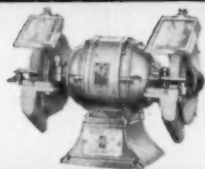
The locating, boring, drilling and reaming of holes in dies, jigs and production parts is reported possible with an accuracy finer than the present limits of the tenth.

Some of the advantages reported include: hardened, precision-ground, hand-lapped steel ways; a wide speed range, 60-2250 rpm; and centralized controls for spindle speeds and feeds.

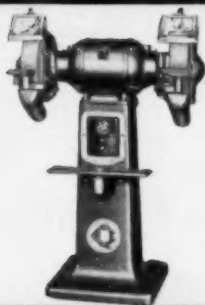
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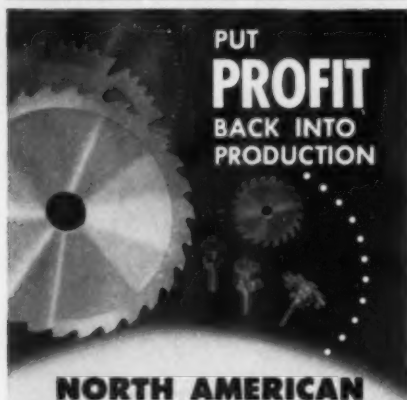
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## Ball Bearing Master Die Set

The new Lempco ball bearing master die set offers complete interchangeability—all parts are interchangeable with like parts of every other Lempco master set anywhere. One master die set may be used for a number of dies, thereby saving on die sets and on storage and handling.

The set features quick setup and easy changeover; mounts dies for processing all materials. It incorporates a ball-



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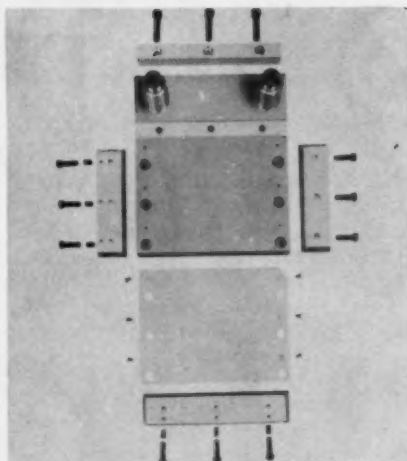
The right tool for the right wood, metal or plastic. Smoother cutting line, no ripping, no chipping. Makes big cuts in replacement and maintenance costs. Write for free catalog today.



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Exploded view of bottom of die set

bearing feature which eliminates lubrication worries and assures best alignment for millions of strokes.

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3 lbs.  
4.10

Spreads like paste - Hardens to metal  
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Single End	4 Flute	$\frac{1}{8}$ " Shank $\frac{3}{16}$ " Shank

Stub Length— $\frac{1}{32}$ " Increments from  $\frac{1}{32}$ " to  $\frac{3}{16}$ "

Now  $\frac{1}{64}$ " Increment Sizes in 2  
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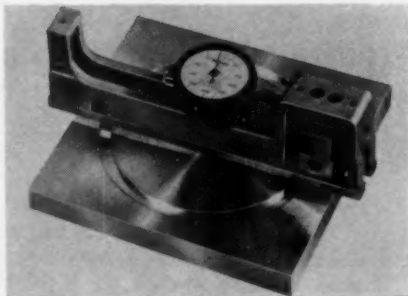
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## Shallow Bore Gage

Low cost shallow gaging is said to be possible with the Unigage Model 14-323. Inside-outside diameters can be inspected to a depth of 1", from 1" to 6" dia. The gage can be used as a portable instrument or bench mounted for special uses, such as hole location and length gaging.

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Gage shown checking shallow groove, inside diameter.



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For quality, price and service investigate KEO combined drills and countersinks, T-slot cutters, center reamers and lathe mandrels. Big stock for fast delivery.

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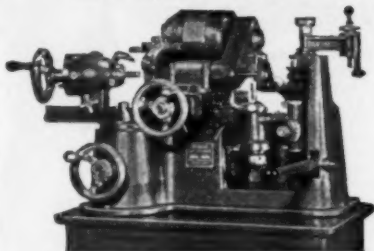
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Warehouse: 1300 S. Soto St., Los Angeles 23, Calif.

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## HYBCO TAP GRINDER

Sharpens Chamfers, Flutes and Spiral Points



Model 1100

• Capacities No. 0 Machine Screw to  
1 1/2" Hand Taps

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## SPELLMACO "SPOTTERS"

A matched set of transfer punches  
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Used for transferring location of threaded, drilled  
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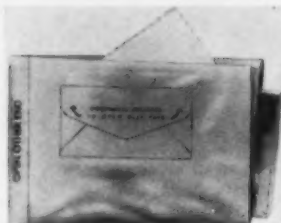
Precision made of finest tool steel—Carefully heat treated and tempered for  
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Set No. 3-17, 28 punches with indexed stand—sizes 3/32" to 1/2", by 1/64"—  
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The Jiffy Duo Bag has an overlapping back seam to form a water-resistant envelope which can be used for documents, letters or any first class material. The bag itself is a regular padded shipping bag for product use. The Duo Bag was an integral part of the entry which won best of show award in September 1958 at the U.S. Air Force packaging competition, San Bernardino, Calif.

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Made for small precision work found in all sized shops. Meets your most exacting requirements; releases large capacity borers for heavier jobs. Investigate the savings made possible with the Linley Jig Borer. An inquiry card mailed today will bring you detailed information promptly.

Table Size: 7" x 17½"

Table Travel: 6½"x10"



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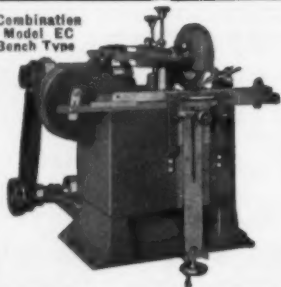
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Model EC  
Bench Type



## Save 80%

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Sharpens Hack, Band and Circular Saws.

We'll be glad to send Model EC literature.

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## Checks Threads for Lead and Taper

The Model A electro-mechanical universal lead tester can check internal threads ranging from 1¼" to 16" diameter, and external threads ranging from

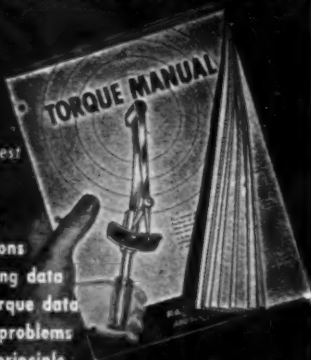


Readings to .00002" for lead, .0001" for taper.

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Formulas  
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June, 1959

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### REDUCE INTERNAL CUTTING COSTS



These fully automatic, quickly adjustable tools save time, cut costs on precision grooving, undercutting, inaccessible spot facing, chamfering, back facing and necking.

They are used with jig or fixture on automatic or manual feed machines. Long-life circular form cutters, or tool bit holders with tool bits may be used. Location and diameter of recess are individually controlled by stop collars, adjustable to within  $\pm 0.001$ -inch. Five sizes available to pilot into 1" to 2¼" bushings. Furnished with shank to suit.

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Division of Bollier-Damerell, Inc.  
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## SUPER-SPEED THREAD BROACHES

These new shearcut, super-speed thread broaches (taps) designed to operate at speeds three to six times normal tapping speeds used for conventional taps, cut tapping



costs from 25 to 75%. Using the Shearcutter principle, these taps require less than half the power needed for ordinary taps. Entirely different from regular taps in design and appearance, this new invention feeds a solid chip out of the hole being tapped. Due to low power required, and their broaching action, they have an exceptionally long useful life. They may be resharpened on any tool and cutter grinder; no special tools or fixtures are

required. This new unit stems from an earlier development which has been successfully used in industry, and during its six years of use has undergone continuous improvement with this latest announcement of the new Super-speed Thread Broach (tap). Manufacturer will send full details on request. Illustration shows the unit itself on left, and unit in action in shearcutting threads in a blind hole, with the continuous one-piece curled chip being fed out of the hole. Write:

Shearcut Tool Co., Dept. P.E.  
7045 Darby Ave., Menlo Park, Calif.

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0" to 16", on work as heavy as 500 lb. It combines the ability to check the lead of straight or taper threads, internal or external threads, and taper of threads or cylinders.

Direct readings are made to .00002" for lead, and to .0001" for taper by means of the Electrolimit gaging principle incorporated in the gaging machine.

Pratt & Whitney Co., Inc., West Hartford 1, Conn.

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In use by major industries for over 25 years

10% Greater Efficiency—10% Lower Cost



Nibblers supplied with either standard or with right angle heads to cut corrugated metal.

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Shear capacities—

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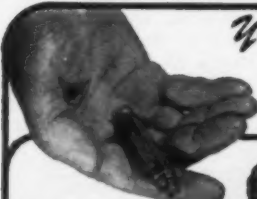
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IN 11 SIZES—No. 6 to 1"  
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Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

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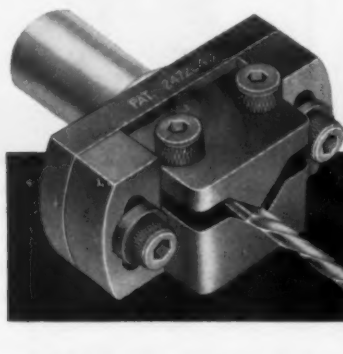
## Increased Range, Capacity for Radial Drills

New improvements in their line of precision radial drilling machines have been announced by the I. O. Johansson Co., Skokie, Ill. Both the range and capacity of the 1 hp, 2 hp and 3 hp models have been increased.

The machine incorporates two work stations, accessible through 360° rotation of ram. Rear work platform, for

handling tall workpieces, has been enlarged to 21½" x 24" and is a precision ground surface, equipped with three ½" T-slots. Adjustable table at front of machine is now available in two sizes, 20" x 28" and 20" x 40". Three T-slots and a coolant trough are incorporated in the tables, which are now ground to an accuracy of .004" over the entire surface.

Sliding radial arm can be moved to



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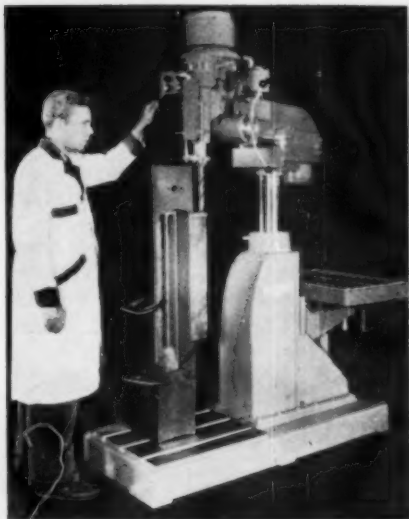


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Panel consolidates controls to left of drilling head for operator's convenience.

within 5" of column or out to drill to center of 5 foot circle. Ram housing is cast and improvements in precision ground machine ways allow greater ease and sensitivity of ram movement.

The upright column housing is now a heavy-walled one-piece casting. Vertical movement of the column permits a maximum of 53" from spindle to working surface, 3½" minimum. Increased size of machine now makes it possible to swing a workpiece over four



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## DEVCON CORPORATION

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The new control panel consolidates all controls to left of drilling head for operator's convenience, regardless of drill head position. Included are main motor control and switches for automatic locking of ram and column movements, motorized elevation and lowering of ram, power down feed to quill and automatic tapping.

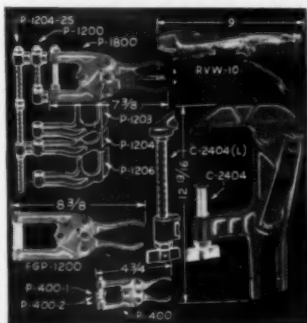
tion attachments have been designed so that the drill head can be locked in desired position radially and horizontally and yet be moved vertically with the drill remaining square to the table within .002" in 12" of travel. Holes up to 18" deep can be drilled by utilizing this device.

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TO MEET YOUR EVERY  
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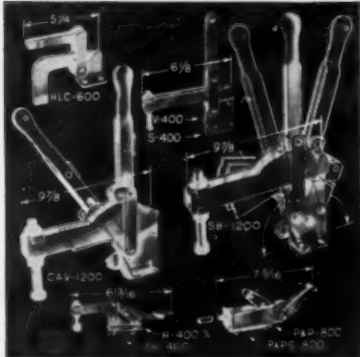
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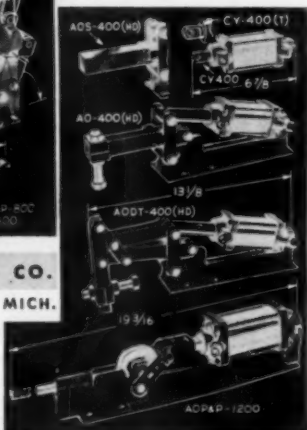
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Manufacturers of over 150 models of manually and air-operated clamps and pliers.

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ranges have been increased to cover a range from 60 to 2400 rpm. Drill capacity up to 1 3/4" in cast iron is offered. The No. 4 Morse taper spindle travels six inches.

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## Hydraulic and Hand Feed Surface Grinders

The Covell No. 17 hand feed surface grinder handles die block and general tool room work with efficiency and

speed. Setup time and operating effort are reduced and accuracy is increased by advanced design features, the manufacturer claims. Capacity of the machine is 10" x 16".

An elevating hand wheel is located conveniently below table level. Both point of wheel contact and hand wheel graduations are simultaneously in operator's view.

Timing belt drive actuates table, elimi-

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2 IN 1  
VISE V-BLOCK**



Probably the most versatile vise — V block ever designed. Saves time. Improves quality. Hardened tool steel. Precision ground. 2" x 2" x 5"

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**Stops Losses**

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Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead  
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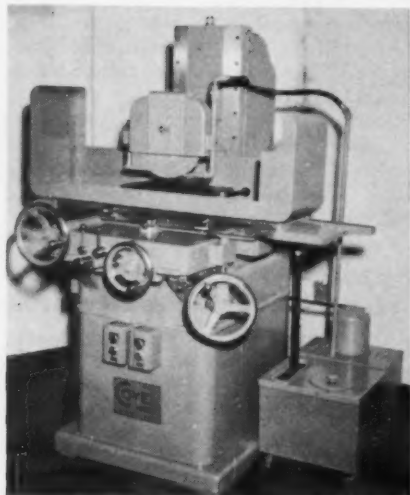


SPECIMEN

With DYKEM Steel Blue Without DYKEM Steel Blue

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**Grinders offer large capacity (10" x 16")**

mates rack and pinion and results in a smoother grind. Only  $2\frac{3}{4}$  turns of large

diameter hand wheel moves table the full 16".

Precision ball-bearing spindle is grease lubricated cartridge type and sealed for life; direct-driven by 2 hp, 1750 motor.

The No. 17H hydraulic model is said to offer high speed grinding and large



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- Engraved beam graduations simplify reading.
- Double jaws permit easy inside, outside and depth measurements—can be locked in position.
- All operating components are completely enclosed.
- Precision built from stainless steel and brass.
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For increased production, greater accuracy, fewer accidents and errors, use the MAGNI-FOCUSER—the new 3-D binocular magnifier with matched prismatic lenses. It provides needle-sharp vision—greatly magnified and in third dimension.

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the 3-D Magnifier that speeds production and leaves both hands free to work



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# ELEVATING TABLE

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*(Eliminates Cranking)*



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- ✓ It's hydraulic . . . positions work or feeds at desired height without use of hands
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## MIDWEST

TOOL & ENGINEERING COMPANY

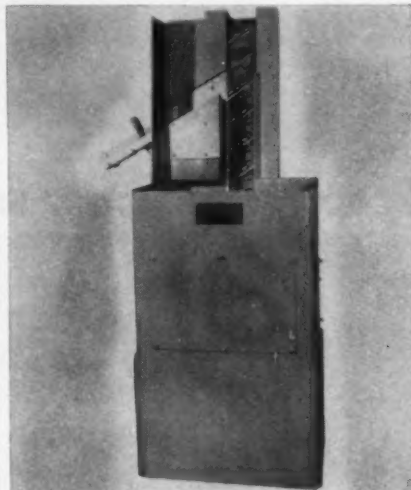
112 WEBSTER ST., DAYTON 2, OHIO  
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cross feed capacity at low cost. The large grinding wheel with plenty of direct power, along with the high speed hydraulic feeds save time in tool room or production precision surface grinding. Massive vertical column supports the grinding head for heavy cuts and fine finish. Convenient controls keep setup time to a minimum.

Covel Mfg. Co., Benton Harbor, Mich.  
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### Automatic Feeder Feeds Wide Range of Small Parts

Scores of different small parts can be fed automatically and at high speed with the Feedall Model 2100. Designed for fast production machines, it feeds sliding parts  $\frac{1}{8}$ " to  $\frac{3}{4}$ " dia. and  $\frac{1}{2}$ "



Feeds parts  $\frac{1}{8}$ " to  $\frac{3}{4}$ " dia.,  $\frac{1}{2}$ " to 2 $\frac{1}{2}$ " long.

to 2 $\frac{1}{2}$ " long. Rolling parts  $\frac{1}{4}$ " to 2" diameter and  $\frac{1}{8}$ " to  $\frac{3}{4}$ " thick also can be fed by the self-powered unit. Hopper capacity is 2 cu. ft.

The portable feeder measures only 24" x 24 $\frac{3}{4}$ " at the base, 50 $\frac{5}{8}$ " over-all height.

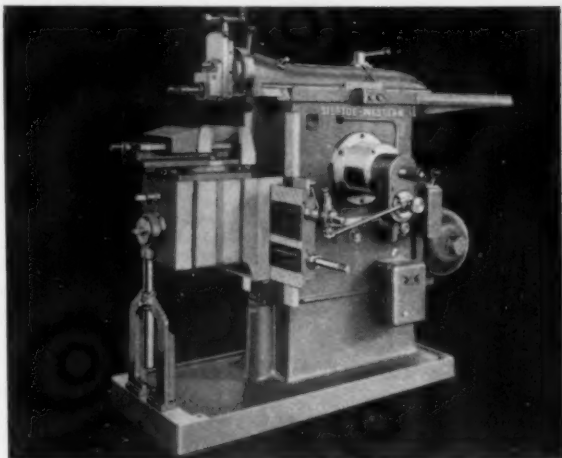
Feedall, Inc., 38399 Pelton Rd., Willoughby, Ohio.

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## Shaper Has 16 Speeds, 8 Power Feeds

Stephoe-Western Model 12X shaper, in universal or plain type, provides a maximum stroke of  $13\frac{1}{2}$ " and 16 geared speeds—9 to 175 strokes per minute. Base and column are cast of semi-steel, with integral oil sump in the base. No fabricated sheet steel is used in any structural members. All slides are planed and hand-scraped and provided with adjustable gibbs.

Transmission gearing in the column and also the helical bull gear and pinion are mounted on Timken bearings. Alloy steel sliding gears within the column are mounted on involute splined shafts. Forced feed



Maximum stroke  $13\frac{1}{2}$ ", 9 to 175 per min.

automatic lubrication, power driven, is available.

All speeds are via sliding gears in

## For LOW COST Hole Production

<p>model <b>"900"</b></p> <p>2 to 8 spindles drilling area to <math>22\frac{1}{2}</math>"</p>	<p>model <b>"500"</b></p> <p>2 to 6 spindles drilling area to <math>18\frac{1}{2}</math>"</p>	<p>model <b>"8-12"</b></p> <p>2 to 15 spindles drilling area to <math>25\frac{1}{4}</math>" x <math>21\frac{1}{4}</math>"</p>	<p>model <b>"400"</b></p> <p>2, 3 or 4 spindles drilling area <math>3\frac{1}{4}</math>"</p>
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model  
**"3-22"**

2 to 15 spindles — drilling area to  $35\frac{1}{4}$ "

**Pick a MULTI-DRILL to Fit the Job**

Commander MULTI-DRILLS — adjustable multiple spindle drill press attachments—are sold and serviced by a nation-wide network of Commander Distributors—experienced, helpful specialists in solving drilling and tapping problems. Write for the name of your nearest Distributor and the complete Commander Production Tool Catalog which contains full details on every MULTI-DRILL and many other production drilling and tapping tools.

**Commander MFG. CO.** 4227 WEST KINZIE STREET  
CHICAGO 24, ILLINOIS

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# GRIND - DEBURR - POLISH

## Faster and Easier with a Dremel MOTO-TOOL

No other grinder, regardless of size, power, or price can take the place of the Dremel Moto-Tool. It's lightweight (16 ounces) and handles like a pencil. Gives the operator extreme accuracy for close-tolerance work—and easy operation in tight places impossible to reach with large grinders. The Moto-Tool's high speed (27000 RPM) makes it ideal for use with small mounted wheel points. It's also handy for production deburring, and a perfect size and weight for women operators.

The Dremel Moto-Tool is an indispensable, all-purpose grinder for the tool room—a time saver for the production line—an industrial favorite since 1936.

Order from Your Supplier or Write for Tool Catalog

**DREMEL MFG. CO. Dept. 219F, Racine, Wis**



Model No. 2  
Moto-Tool only .....\$19.95  
Model No. 2 Moto-Tool Kit  
with 23 accessories and  
storage case .....\$27.50

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progression, without any belt driven variable speed mechanism. Controls are conveniently grouped near operator's position.

Eight automatic reversible feeds, .006"-.053", are provided, controlled at the end of the cross rail. Primary input is through powerful adjustable expanding ring clutch and standard multiple vee belt drive.

Ribbed vee ram is planed and hand-

scraped and provided with adjustable positioning lock and stroke indicator. Instant stop ram brake is synchronized with starting lever.

Specifications: Crossrail 25¼" x 12¾"; table 19½" horizontal travel, 12¼" vertical travel, height 11"; vise opening 9½" max.; motor drive 1½ hp, 1800 rpm, 220/440 volt, 3 phase, 60 cycle.

Western Machine Tool Works, Holland, Mich.

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Dixie maintains true angle and radius to eliminate tangent groove as shown above.

### DIXIE ELIMINATES HAND FINISHING

Dixie Tool leads the way in the production of solid carbide precision cutting tools for die sinking and die making. Where precision and constant radii and angles are required, Dixie solid carbide ball end mills and die sinking cutters maintain their true angle and radius to help eliminate time consuming hand finishing.

Get 10 to 20 times longer tool life with Dixie's exclusive "Micro-Finish" process, and Super-sharp tools required for production of precision dies and molds in today's industry.



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**DIXIE TOOL INDUSTRIES**  
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## Hardening Compound in 3-Oz. Size

A new small-size package for testing purposes contains enough Hard-N-Tuff steel hardening compound to harden all the chisels, drills, and other tools in a fully equipped home workshop. Its case hardening qualities triple the life of tools and parts, the manufacturer claims. Some customers report that tools treated with Hard-N-Tuff last as much as 40 times longer than without treatment. Hard-N-Tuff Corp., Box 275, Huntington, L.I., N.Y.

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Small-size can for testing



# WHAT CAN THEY DO FOR ME?

In a word, plenty.

They can make your taps last up to six times longer.

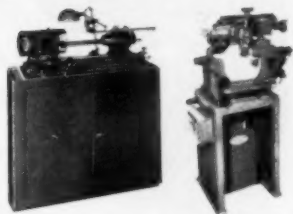
They reduce work spoilage because they enable taps to cut more accurately, more uniformly, with less strain.

They can cut your present tap costs up to 65%.

We didn't get these facts out of thin air. They come from actual case histories in metal-working plants where taps are sharpened regularly with Blake Flute and Chamfer Grinders.

These are high-precision machine tools. But they are not expensive. And they're simple enough to operate so that anyone in your plant can become accomplished at precision tap grinding with a minimum of fuss and feathers.

WANT PROOF? Just ask for it. You'll be glad you did.



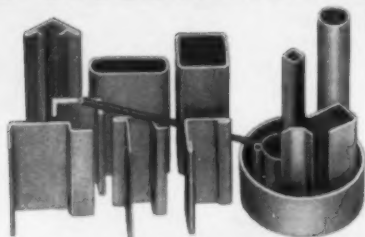
Blake Chamfer Grinder/Blake Flute Grinder

Blake — and only Blake Flute and Chamfer Grinders, used in combination, create or restore: 1. exact indexing of cutting edges 2. controlled rake angles for each job 3. correctly ground spiral points 4. perfectly relieved chamfers . . . make one tap do work of six!

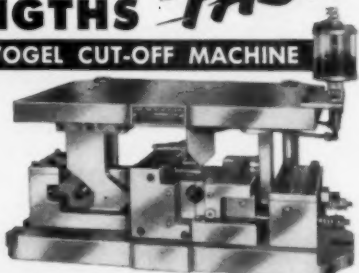


EDWARD **BLAKE** COMPANY, INC., 140 CHERRY STREET, WEST NEWTON 65, MASS.

# SHEARS CLEAN TO ACCURATE LENGTHS *FAST!*

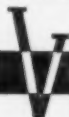


**VOGEL CUT-OFF MACHINE**



With each press stroke, unit accurately cuts off tubing and shapes into lengths of  $\frac{1}{2}$ "  $\pm .010$ ", or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

No. 12 unit cuts up to  $\frac{3}{4}$ " O.D. x  $\frac{3}{32}$ " wall.  
No. 2 unit cuts up to 2" O.D. x  $\frac{1}{8}$ " wall.  
No. 3 unit cuts up to 3" O.D. x  $\frac{3}{16}$ " wall, or up to  $3\frac{1}{2}$ " O.D. x  $\frac{1}{8}$ " wall.  
Odd shapes handled in sizes equivalent to unit's O.D. capacity.



**VOGEL TOOL & DIE CORPORATION**

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## NEW... 15 Ton Deep Throat



### O.B.I. PRESS

12" THROAT DEPTH accommodates many trimming, drawing, forming, blanking and punching operations on metals, leather and plastics that would otherwise have to go on larger presses.

The **RUGGED FRAME** is a steel weldment, heavily reinforced at points of strain to provide maximum rigidity when the press is operated at full capacity.

The heavy duty features of PRESS-RITE models to 85 Tons built into this press make it an extra rugged unit. For complete information ask your PRESS-RITE Dealer or write for Bulletin 459.

**PRESS-RITE DIV.**

PRESS-RITE O.B.I. Models from 2 Ton to 85 Ton. HAVIR (formerly DIEBEL) Production Automatic Models, 5 Ton to 150 Ton.

**Sales Service Mfg. Co.**

2361 University Ave.

St. Paul 14B, Minn.

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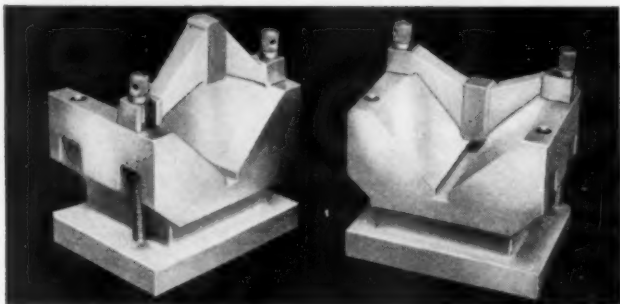
## Nylon Sleeves for Taper Shank Drills

"Drill Saver" and "Use-Em-Up" nylon drill sleeves are claimed to present a new concept in driving sleeves for taper shank drills. The physical properties of nylon are such that the sleeves can accommodate a few thousandths of galling or nicking on the drill shank or in the spindle, yet allow the drill to run in a central position. The sleeves reduce drill breakage, minimize spindle inaccuracies. Union Twist Drill Co., Athol, Mass.

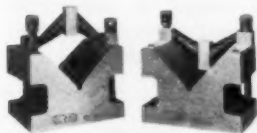
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**Top: Drill Saver** absorbs all vibration. **Bottom: Use-Em-Up** seizes the drill shank and drives it without drill tang.



**NEW — No. 9132 Meehanite V-Blocks** hold workpieces from  $\frac{1}{2}$ " to  $3\frac{1}{4}$ " diameter. Sold in matched pairs.



**No. 9128-30 V-Blocks** are made from alloy steel, hardened and ground. Capacities from  $\frac{3}{4}$ " to 3". Sold in pairs.



**No. 9131 Universal V-Blocks** have an accurate hole in each "V" for quick locating on faceplate or machine table. Maximum capacity —  $1\frac{1}{2}$ " diameter. Sold singly or in pairs.

## Speed and Simplify Setups with Taft-Peirce PRECISION V-BLOCKS

A complete stock of Taft-Peirce V-Blocks will help you save time and increase accuracy on all types of machining and inspection setups. Working surfaces are precision ground with tolerances in "tenths", and blocks can be used in any position. Reversible clamps may be inverted, swung aside, or slipped off entirely for fast work insertion and removal. Order Taft-Peirce V-Blocks now — capacities to 8" diameter.

Send for New Catalog 511 on Production and Inspection Equipment. 34 pages showing complete line.

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**TAFT-PEIRCE**



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Plain plugs .025 to 7.000 ins.  
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Thread rings and .030—.125 to 12.000 ins thread plugs

Dealer and Mfg. rep. inquiries invited—  
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Phone: MOnroe 6-8567

2119-21 W. Hubbard St., Chicago 12, Ill.

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When attached to a one-quarter-inch drill, the Torc Booster provides approximately five times the normal torque of the drill, giving the quarter-



**Tool multiplies drill's torque by five.**

inch drill almost the capacity of a one-half-inch drill, yet reduces the danger and hazard of the larger size drill. It allows complete control over jamming and chatter.

When the user grips the body, the tool begins operation. When he releases it, the tool stops instantly, but the power unit may be kept on constantly.

The grip of the hand allows one to "feel" control at all times. Should chatter or jamming occur it can be felt in the grip of the hand.

The tool performs quick, safe tapping without breakage, power reaming with hand reaming control. Other performances include nut running, wood boring, honing, and masonry drilling.

Grip-Torc Tools, 17480 Shelburne Way, Los Gatos, Calif.

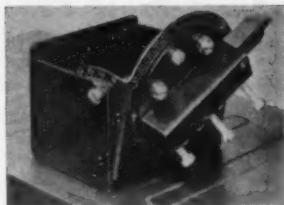
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## Low Cost Tool Bit Grinding Fixture

This tool bit grinding fixture for use on surface grinders is of sturdy, pressed steel construction, with precision ground master surfaces. It quickly sets up for any combination of rake and clearance angles; grinds all sides in one setting; holds any single point tool. The fixture is inexpensive enough to allow the operator to set up one fixture at each machine for fast duplicate tool bit grinding. Montgomery and Co., Inc., Springfield, N.J.

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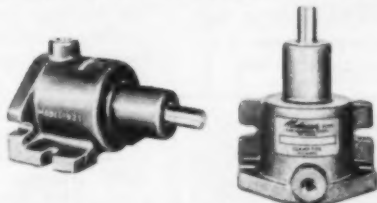


Holds any single point tool



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**UNIVERSAL MOUNTING** for easy vertical or horizontal installation.

**SLOTTED MOUNTING HOLES** save installation, relocation time.

**SPRING-RETURN TYPE CYLINDER** operates from simple 3-way valve (MODERNAIR CRV or BV series recommended). Has  $\frac{1}{8}$ " NPT port.

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$1\frac{1}{8}$ "	\$ 8.50	\$ 9.75
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**Modernair** CORPORATION

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## Spark-Proof Fans Added To Mist Collector Line

Non-magnetic, spark-proof fans have been added to the Mistkop line of mist-fog collectors. The aluminum fans reduce the danger of explosion as they reportedly do not attract metal fragments or give off sparks in the event of accidental contact.

The Mistkops are said to be completely fire-proof. They consist of a fan, filter and condensate element. No spe-



cial connections are needed. The collectors have suction capacities from 600 to 3600 cfm.

Aget Manufacturing Co., Adrian, Mich.  
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## LEAD HAMMERS— Buy Cook "SHUR-GRIP"



They're a **MUST** in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

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**LAWRENCE H. COOK, INC.**

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MODERNTOOLS**

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New York 16, N. Y.

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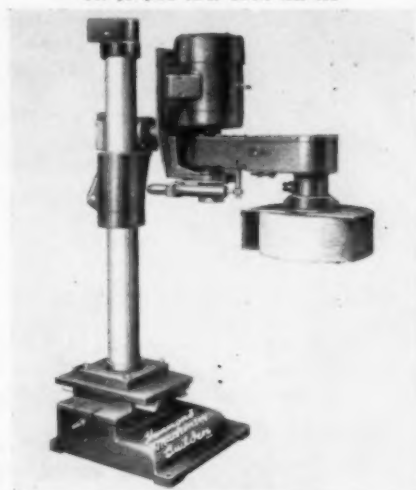
## Heavy Duty Floating Type Polishing/Buffering Head

A heavy duty floating type polishing or buffing head is suitable to use on rotary conveyor automatic turrets or straight line conveyors where floating action on irregular shaped parts is required.

The head is available with 10, 15 or 20 hp motor and multi-V-belt drive.

Hammond Machinery Builders, Inc.,  
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A Hitchcock Publication

Wheaton, Ill.

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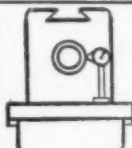
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## Don't Overlook These Features

MACHINE AND TOOL  
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**Washington News.** A report on the budget and economic growth has been made by the Research and Policy Committee of CED; the GOP reconsiders its stand on sustaining tax rates; Congress overshoots the budget.

**Pneumatic Devices.** Inexpensive pneumatic operated devices can solve production bottlenecks and cut costs. H. L. Stewart describes two typical applications concerned with valve liner production, featuring simple but effective piping layout.

**Practical Arbitration.** Harold R. Nissley carries on where he left off in Part V. Whereas that installment was concerned with the approach taken by a company president in disposing of 30 grievances, this article deals with five of the grievances and how Mr. Nissley answered them.

**Abrasive Cut-off Wheels.** John A. Mueller continues his discussion of recommendations for using abrasive cut-off wheels most efficiently by disclosing more results of tests conducted in Carborundum's laboratory.

**Scientific vs. Add-on Turret Lathe Design.** Throughout the years, the "add-on" process has been the history of turret lathe development. A fresh, scientific approach is beyond the talking stage and eventually should prove fruitful. The accompanying improvements in efficiency and performance promise to be significant.

**Tool Grinding.** DeVlieg's new Micropoint tool grinder is designed to grind single point tools of carbide, H.S.S. and ceramic up to 1" square or round. Set-up is merely a matter of direct dial readings, assuring precise repeatability.

**Layout Machine.** Layout time has been cut 75% at the Ingersoll Milling Machine Company plant in Rockford, Ill. with the aid of two Portage layout machines.

**Drilling and boring accuracy.** For extremely high accuracy in heavy duty drilling and boring jobs, the American Tool Works Co., Cincinnati, offer their new tape-controlled positioning table.

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# Mechanics Through The Ages



**AS EARLY AS 500 BC** THE METAL WORKING CRAFTS OF GREECE WERE SO HIGHLY SPECIALIZED THAT HELMETS, BODY ARMOR, SHIELDS AND LANCES EACH WERE PRODUCED BY A DIFFERENT GUILD!

**I**T WAS PARTLY DISGUST OVER THE REFUSAL OF HIS FARM LABORERS TO GIVE UP THE OLD-FASHIONED METHOD OF BROADCAST SOWING THAT INSPIRED **JETHRO TULL**, FAMED BRITISH AGRICULTURIST OF THE EARLY 1700'S, TO DEVELOP HIS ROW-SEED-MACHINE DRILL.



**ALTHOUGH** HE PROVED TO BE THE OUTSTANDING SCOTTISH MECHANIC OF HIS TIME **JAMES WATT**, PIONEER DEVELOPER OF THE STEAM ENGINE, WAS ONCE REFUSED GUILD PERMISSION TO OPEN AN INSTRUMENT MAKER'S SHOP IN GLASGOW-BECAUSE HE FAILED TO SERVE A COMPLETE APPRENTICESHIP

**Now** — NO plate too small — **213B**

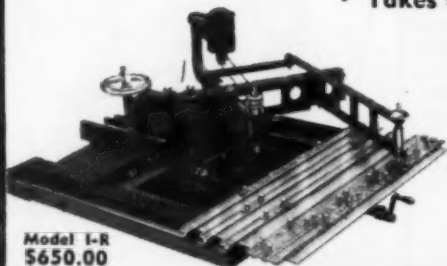
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**NO  
size limits  
on engraving**



ENGRAVES 18"x6" RECTANGLE IN ONE SET-UP

- Takes up only 2 feet of bench space
- Engraving chassis can be detached from base and placed directly on work-piece of any dimension
- Self-centering workholder cuts down set-up time
- Heavy duty cutter spindle



Model I-R  
\$650.00

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**new hermes** ENGRAVING MACHINE CORP.

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Stones, Belts, etc., 3, 207  
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858-8	Gear	3780	6300
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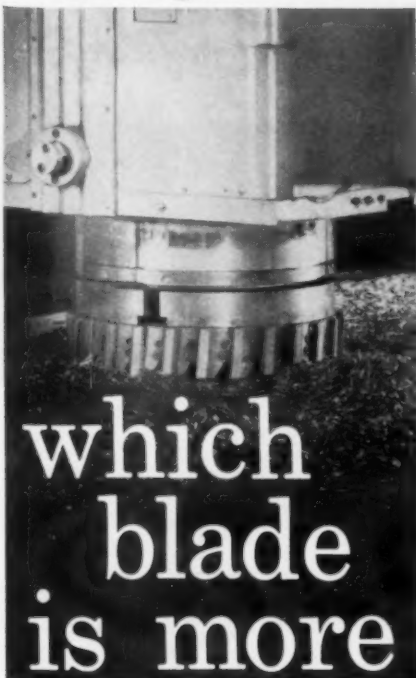
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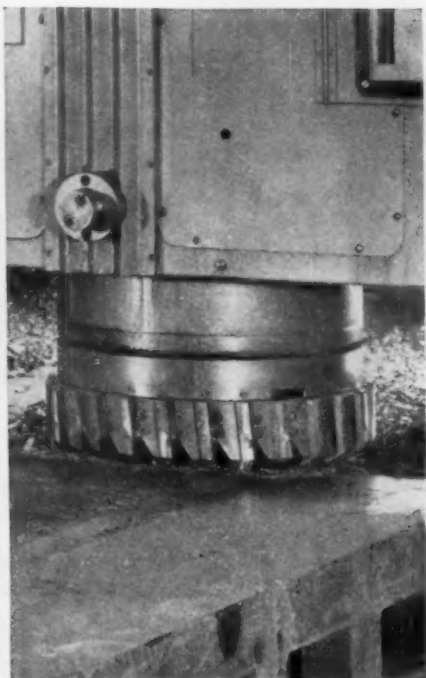
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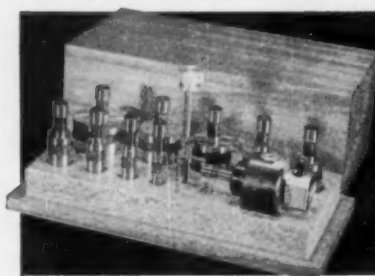
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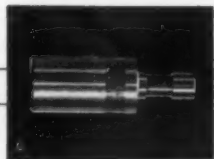
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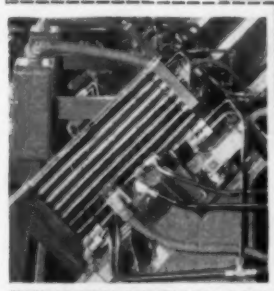
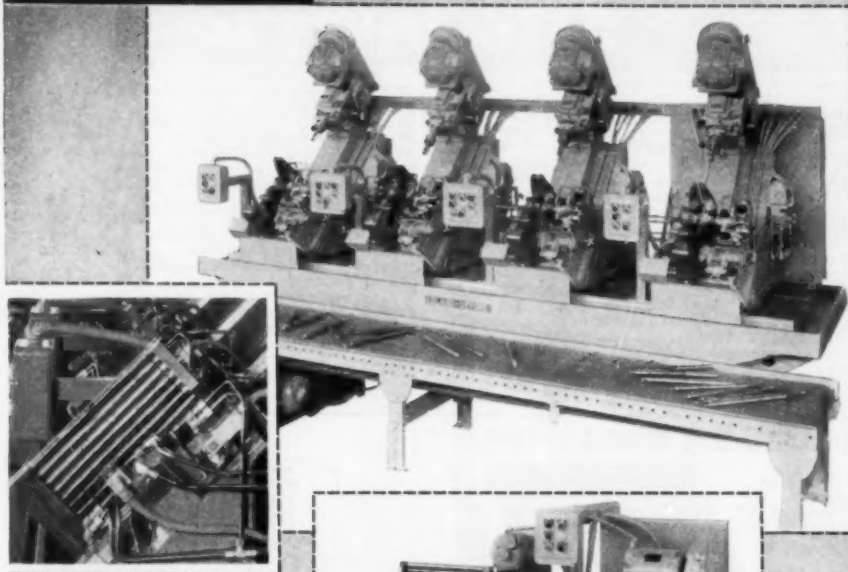


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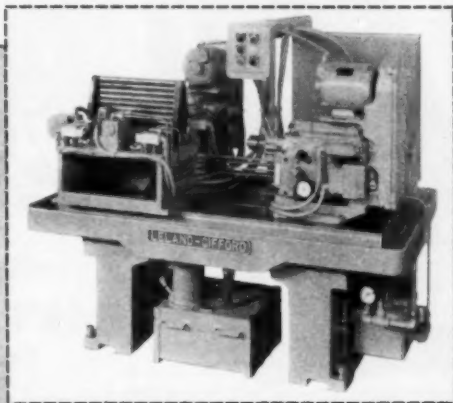
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Standard Horse Nail Corporation	243	(Rockwell Manufacturing Company)	
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		West Chemical Products Company	143
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Thriftmaster Products Corporation	222	(American Chain & Cable Company)	
Titan Tool Company	279	Woods Machine Company, S. A.	82
Tomkins-Johnson Company	53	Woodson Tool Company	270
Torit Manufacturing Company	247		
Twentieth Century Manufacturing Company	276	Zagar, Inc.	1

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4	9/32	I	16.15
4	5/16	I	16.55
4	7/16	I	17.80
4	9/16	I	20.75
4	11/16	I	21.80
4	13/16	I	25.20
4	15/16	I	27.75
4	I	I	28.60
4	I - 1/8	I - 1/4	31.20
4	I - 1/4	I - 1/4	34.30
5	1/4	I	21.15
5	5/16	I	21.55
5	3/8	I	23.80
5	7/16	I	25.35
5	9/16	I	28.45
5	11/16	I	31.80
5	13/16	I	34.30
5	7/8	I - 1/4	36.90
5	15/16	I	36.40
6	1/4	I	26.05
6	5/16	I	26.70
6	3/8	I	28.65
6	7/16	I	30.55
6	9/16	I	36.05
6	11/16	I - 1/4	38.65
6	13/16	I - 1/4	42.40
6	7/8	I	43.45
6	15/16	I - 1/4	45.55
8	1/4	I	56.45
8	5/16	I	60.10
8	3/8	I	61.75
8	7/16	I	64.95
8	1/2	I	66.00
8	9/16	I - 1/4	68.50
8	5/8	I - 1/4	69.55
8	11/16	I - 1/4	71.80
8	13/16	I - 1/4	74.20
8	7/8	I - 1/4	77.40
8	15/16	I - 1/4	81.30
10	1/4	I - 1/2	106.32
10	5/16	I - 1/2	107.58
10	3/8	I - 1/2	100.30
10	1/2	I - 1/2	107.30
10	5/8	I - 1/2	121.70
10	3/4	I - 1/2	140.30
10	7/8	I - 1/2	145.15
10	I	I - 1/2	150.35
12	1/2	I - 1/2	169.35
12	5/8	I - 1/2	186.70
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12	7/8	I - 1/2	242.10
12	I	I - 1/2	260.25

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5	1/4	I - 1/4	24.15
5	5/16	I - 1/4	25.20
5	3/8	I - 1/4	26.70
6	5/16	I - 1/4	35.60
6	7/16	I - 1/4	36.65
6	9/16	I - 1/4	42.40
6	11/16	I - 1/4	46.10
6	13/16	I - 1/4	53.40
6	15/16	I - 1/4	57.60
8	5/16	I - 1/4	72.95
8	7/16	I - 1/4	77.15
8	9/16	I - 1/4	81.45
8	11/16	I - 1/2	87.35
8	13/16	I - 1/2	91.65
8	7/8	I - 1/2	95.60
8	I	I - 1/2	99.90
10	1/4	I - 1/2	101.40
10	5/16	I - 1/2	102.90
10	3/8	I - 1/2	104.10
10	7/16	I - 1/2	110.50
10	1/2	I - 1/2	115.20
10	9/16	I - 1/2	126.40
10	5/8	I - 1/2	130.60
10	3/4	I - 1/2	142.30
10	7/8	I - 1/2	146.85
10	I	I - 1/2	153.10
12	1/2	I - 1/2	176.50
12	5/8	I - 1/2	188.05
12	3/4	I - 1/2	199.60
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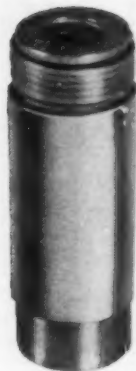
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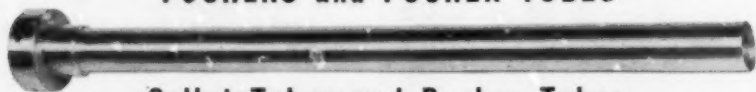
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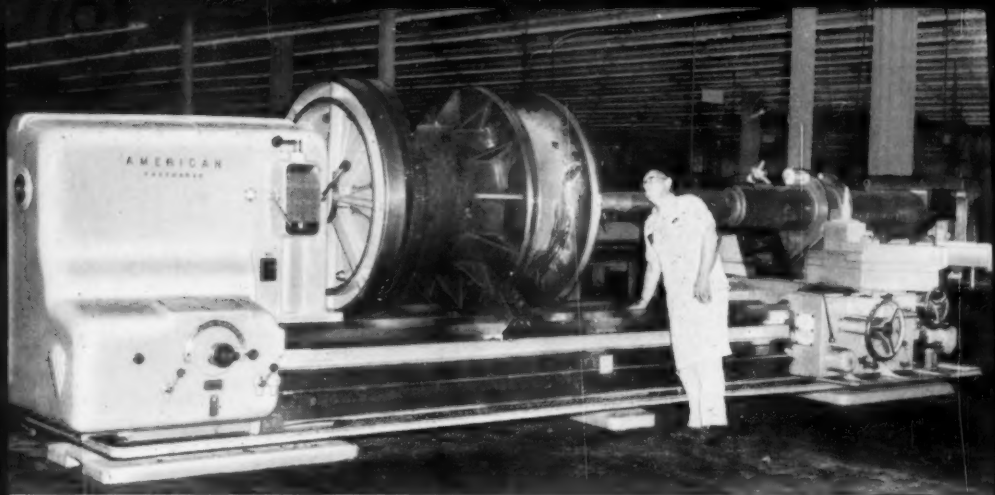
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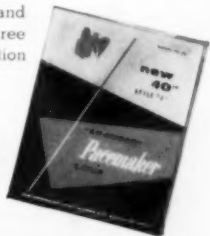


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